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ART. XLIII.—ON SYRUP OF WILD CHERRY BARK, AND ON
THE POWER OF HYDROCYANIC ACID IN PREVENTING
FERMENTATION.

By DANIEL S. JONES.

A FORMULA for the preparation of a syrup from the bark of the Wild Cherry, (*Cerasus serotina*) was first published by Messrs. Procter and Turnpenny in the American Journal of Pharmacy, vol. xiv. p. 27.

They direct four ounces of the powdered bark to be macerated in twelve fluid ounces of water for forty-eight hours, and then treated by displacement until twelve fluid ounces of infusion is obtained, which is made into a syrup by dissolving in it twenty-four ounces of pulverized sugar, without heat.

The concentrated form in which the properties of wild cherry bark are here presented, its agreeable taste, and the readiness with which it may be resorted to, either by itself or in combination with other remedies, gives it an advantage over the officinal infusion, and has caused it to supersede, to a great extent, that preparation. In some instances, however, the large amount of sugar employed constitutes an objection, as it is found to cloy and nauseate the stomach, particularly when its use has been continued for some length of time.

Having observed the perfect manner in which this syrup kept whilst others under similar circumstances readily fermented, and with a view of ascertaining whether a smaller quantity of sugar might not answer the purpose of preventing fermentation or decomposition of the preparation, I was induced to make the following experiments:—

An infusion was made by maceration, as above directed, and divided into four equal quantities. One portion was made into a syrup with the usual quantity of sugar, in the second the amount of sugar and infusion were equal; in the third the proportion was two of infusion to one of sugar; and in the fourth portion as three to one. They were then placed together in a situation where the temperature varied from 75° to 80° Fahr. No perceptible change took place in any of these syrups until about two months after they were prepared, although the corks of the bottles containing them were frequently opened. At this period a slight deposite of apotheme began to take place in the syrup containing the least quantity of sugar. In a short time after a similar precipitate was observed in the syrup, in which the infusion doubled the sugar in quantity. The syrup containing equal parts of sugar and infusion, kept perfectly, in all respects, like that made with the full proportion of sugar.

More than six months have now elapsed since these preparations were made (in which time they have been exposed to the ordinary temperature of the store during the past summer,) and the two last mentioned syrups remain unchanged, whilst the others, though they contain an increased deposite of apotheme, appear to retain their other properties unimpaired.

With the design of discovering whether the hydrocyanic acid present in these syrups was the cause of their not fermenting, an infusion similar to the other was boiled for some time, in order to dissipate that principle, and then divided into two portions. With one of these a syrup was made

with twice its weight of sugar, and with the other an equal weight was used, and the syrups which they yielded were placed in a warm situation, similar to that of the preceding experiments. In twelve days the least concentrated commenced fermenting, and was soon covered with mould, and the other underwent the same change shortly after.

To test whether the tannin in wild cherry bark syrup played any part in preventing its fermentation, a syrup was made with an infusion of white oak bark, precisely like the preceding, and divided into two parts; to one was added five drops per ounce of hydrocyanic acid, containing four per cent., the other was left without addition. In a few days the latter commenced to ferment and soon spoiled, whilst that containing the hydrocyanic acid remains unchanged, notwithstanding its exposure to the great heat of last summer.

Syrup of Seneca snake root, which is always difficult to keep in summer, is entirely freed from a disposition to ferment by the addition of a little hydrocyanic acid.

When hydrocyanic acid is added to a mixture of yeast, sugar and water, all tendency to fermentative change is suspended, and the power of the yeast destroyed during the presence of the acid.

These facts are stated merely to illustrate the position that the ready keeping of a syrup of wild cherry bark, made without heat, is due solely to the hydrocyanic acid which enters into its composition,—and not with a view to this acid being used as a preservative agent, which of course its deleterious qualities entirely precludes.

As the above experiments prove conclusively that there is no objection to reducing the proportion of sugar in this syrup on the score of preservation, and as an excess of saccharine matter is often objectionable, it is recommended that the proportion of sugar to the infusion be as five to three instead of as six to three, as at present, which will increase its strength and render its manufacture more easy.

While on this subject it may be well to mention, that a much better way of effecting the solution of the sugar, is to introduce it into the infusion in a pulverized state, and agitate it until dissolved in a stopped bottle.

ART. XLIV.—EXTRACT FROM THE MINUTES OF THE BOARD OF TRUSTEES OF THE COLLEGE OF PHARMACY OF THE CITY OF NEW YORK, July 3d, 1845.

THE Committee of Inspection, to whom the Opium exhibited at the last meeting of the Board, by Mr. W. L. Rush-ton, was referred, beg leave to report, that

The specimen of opium in question was a thin oval cake, which had been covered with a large leaf, whose impression still remained upon its surface. It was more soft and moist, and contained more gummy or mucilaginous matter than Smyrna opium. In fact, it answered in every respect, the description which Pereira (page 1728, vol. 2, Elements of Mat. Med. and Therap., 2d Eng. edition) gives from Professor Guibourt, of the inferior kind of the Constantinople variety

Parcels of 100 grains, or more, were examined by each of the committee, to ascertain the quantity of morphia it would yield. The result closely approximated, showing that not more than four per cent. could be obtained from the sample exhibited as above.

The committee has since been informed that the entire parcel, consisting of ten cases, was not sold in New York, but transmitted to Boston; but, as it may again appear in this market, it is thought advisable that the trade should be put upon their guard, lest purchasers, by some reduction in price, should be induced to buy without sufficiently careful

examination. Thus far was therefore published in the Journal of Commerce and Express, and also in the Boston papers.

Your committee are informed that these ten cases of opium, after being sent to Boston, were sold to a wholesale druggist in this city, with a guarantee as to quality; samples being sent on to him, portions of these samples amounting to 1000 grains, were examined and found to fall short of the per centage of morphia mentioned above. Your committee also have learnt that other samples of the same opium, by order of the owner, have been examined by Dr. Jas. R. Chilton, who has given a certificate of its containing five per cent. of morphia.

All which is respectfully submitted.

Signed,

JOHN H. CURRIE, Chairman.

July 3d, 1845.

It was on motion, Resolved, That the report of the Committee of Inspection be sent to the publishers of the American Journal of Pharmacy, to publish if they think proper.

By order,

JOHN MEAKIM, Secretary.

REVIEW.

ART. XLV.—ELEMENTARY CHEMISTRY, THEORETICAL AND PRACTICAL. By **GEORGE FOWNES, PH. D.**, Chemical Lecturer in the Middlesex Medical College and to the Pharmaceutical Society of Great Britain. With numerous Illustrations. Edited by **ROBERT BRIDGES, M. D.**, Professor of General and Pharmaceutical Chemistry in the Philadelphia College of Pharmacy. Philadelphia, Lea and Blanchard, 1845. 1 vol., 12mo. pp. 460.

WITHIN a few years past the American chemical student has been particularly fortunate in having had placed at his disposal the works of several of the most prominent English chemists, in an American dress. Turner's, Kane's and Graham's have successively appeared, and now we have that of Fownes, which, whilst it makes no pretension, and is much more concise than the treatises before mentioned, deservedly claims to have presented the subject in a light and manner well calculated to facilitate the acquisition of chemical knowledge. Although the author has suited the arrangement of his work to the course of Lectures that he delivers; and has designed it as a "convenient and useful class book for his pupils," yet there are no peculiarities about it which unfit it for the general student, or for the pupils of other lecturers. The author's style is lucid, and he possesses the faculty of expressing much in a few words, so important in works of the kind.

The first division of the book is devoted to physics, and comprises the subject of specific gravity, the physical constitution of gases, heat, light, electricity and magnetism. This part of the work is fully illustrated by figures and diagrams, the importance of which, as helps in chemical study, is becoming every day more evident.

The second part comprises, first, a history of the non-metallic elements; afterwards, the compounds of these ele-

ments among themselves; and lastly, the general principles of chemical philosophy. This arrangement is out of the usual course. We are accustomed, in elementary works, to see the laws of combination, affinity, the atomic theory, and the influence that electricity exerts in the composition and decomposition of bodies, discussed, before treating of the bodies themselves; so that in afterwards reading of the properties of substances, their relations to each other become apparent. Of the propriety of this change there may be a difference of opinion; yet as most of the leading general laws of chemical philosophy are readily comprehended, and as even a partial knowledge of them adds much to the interest of chemical studies, some acquaintance with them previous to entering on a consideration of the elementary bodies and their compounds, seems almost indispensable.

The third division embraces the chemistry of the metals. After stating the general properties of the metals, a full chapter on crystallography follows, which comprehends the subject of isomorphism, or the relation which has been found to exist between the crystalline form and chemical constitution of bodies. The grouping of bodies in their isomorphous relations, is now considered the true basis of a natural classification; and although all the elements have not been brought under the arrangement, owing to the difficulty of discovering the crystalline structure of many of them; yet sufficient has already been ascertained to give the subject a deep interest. The binary theory of salts is cursorily treated of, and is favorably viewed by the author, although he admits of difficulties, yet to be removed, before it can be unhesitatingly adopted.

In treating of the metals and their compounds, the author has introduced several improvements, which add much to the usefulness of the work as a text-book. Among them is the illustration, by diagrams, of the more complex chemical changes, as in the rationales of the processes for making the mercurial chlorides, the sulphuret of antimony, and some of

the cyanogen compounds. Another and equally important feature, is a short series of test directions, appended to each chapter on the metals, to enable the student to distinguish them and their compounds from each other. This is a decided improvement, and supplies a want which is often felt in referring to chemical works for that kind of information; for notwithstanding that most of it may be found in the ordinary treatises, yet it is scattered through the text and cannot so readily be resorted to. The free use of symbolic formulæ extends throughout the book, and give an air of exactness to all its parts.

In looking over the list of equivalent numbers of the metals, several changes appear, as is the case in Kane's and Graham's. The atomic numbers for mercury and gold are just one-half of Turner's number, and those for arsenic and antimony are doubled. The author observes: "As the salts of the red oxide [of mercury] are most stable and permanent, that substance may be regarded as the true protoxide instead of the grey oxide, to which the term has usually been applied. Until, however, the isomorphous relations connecting mercury with the other metals shall be established, the constitution of the two oxides, and that of the corresponding chlorides, iodides, &c., must remain somewhat unsettled."

In the case of antimony, the sesqui-oxide, sesqui-chloride and sesqui-sulphuret, become ter-compounds, in which one equivalent of the metal is united with three eq. of the other elements respectively. Ter-chloride and oxide of gold become sesqui-chloride and oxide;—and the acid oxides of arsenic become ter, and quinto, compounds allied in atomic arrangement to the acids of phosphorus.

However consonant with truth these alterations may be, the changes of nomenclature incident thereto are much to be regretted in a pharmaceutical sense—as the old chemical names for calomel and black oxide will now indicate corrosive sublimate and red precipitate.

The last, and by far the largest division, has been devoted to organic chemistry. The author regrets that in the composition of this portion of his work he has been compelled, by the short space allotted, to treat the subject in too brief and unsatisfactory a manner. The relative space on this subject, however, is greater than in the larger works, and the author has succeeded in giving a fulness of detail hardly to be expected. The subject is introduced by a chapter on the ultimate analysis of organic bodies, which is well illustrated with engravings.

Substances of the saccharine and amylaceous class, with their derivatives, by the action of fermentation, acids and alkalies, are first considered. Afterwards, the benzyle and salacyle series, the vegetable acids and alkalies, the cyanogen compounds, etc. The number and complexity of the subjects treated of, renders any notice of them individually out of place here; but it may be sufficient to state, that all important substances and processes have been dwelt upon, and a vast number of compounds of less interest noticed. The new views of Leibig, Mulder, and others, have been presented in the concluding chapters on animal chemistry, which brings the work down to the present time.

With respect to the book itself, saving the objection that the type is rather small and closely set, the typography is good, and the paper quite equal to that of other similar works. On the score of exactness, it will be sufficient to mention that it has passed under the close supervision of Dr. Bridges, who, besides correcting errors incident to a first edition, has added occasional notes of observations made since the issue of the English copy.

W. P.

ART. XLVI.—THE DISPENSATORY OF THE UNITED STATES OF AMERICA. By GEORGE B. WOOD, M. D., Prof. of Mat. Med. in University of Pennsylvania, and FRANKLIN BACHE, M. D., Prof. of Chem. in Jefferson Medical College. Sixth Edition: 1845. pp. 1368. Philadelphia: Grigg and Elliott.

A SIXTH edition of this useful and popular work has been put forth, thus presenting the latest and most accurate information upon the subjects of which it treats. A eulogy of the merits of the U. S. Dispensatory would be at this time misplaced, as it is familiar to the readers of this journal as an indispensable guide and the highest authority in the prosecution of their business; our views, moreover, have been already expressed, and we could not do more than repeat them. Since the publication of the previous edition so short a time has elapsed, that little could be found, comparatively, to add to the present. Such additions, however, have been made as the periodical press and other sources afforded, either in the way of extension to the matter which already constituted the work, or new matter arising from discoveries and improvement in the branches with which it is occupied. The latter more particularly will be noticed in the Appendix.

ART. XLVIL.—OBSERVATIONS ON MYRRH.

By C. H. RUICKOLDT.

ACCORDING to Ehrenberg, myrrh is derived from *Balsamodendron Myrrha*, N. ab Esenb. It is secreted in the form of an oily juice from the bark of the tree, resembling cherry-gum, soon hardens by exposure to the air, and gradually becomes reddish or red-brown. In general only one kind is forwarded by way of Cairo, the *Myrrha naturalis*, which is then sorted in the European markets. It is doubtful what the ancients understood by myrrh. Its use as a medicine was known at the remotest periods; it was employed for fumigation in sacrifices, as a spice with food, for perfumery and for embalming the dead. The following are the kinds known in commerce:—

1. *Myrrha electa*.—Irregular, larger or smaller, angular or tear-shaped fragments, of a light yellow to a dark brownish-red colour, semi-transparent, usually coated with dust, but sometimes bright and possessed of lustre. On the surface of fracture it is uneven, has a waxy or fatty lustre, and exhibits numerous white curvilinear veins. The odour is peculiar, the taste bitter, balsamic. The specific gravity, according to Martius, is 1.360. When breathed on, the fragments exhibit a more lively lustre and are somewhat fatty to the touch. When chewed, this myrrh readily breaks into fragments and adheres firmly to the teeth; at the same time the saliva is rendered milky. On being heated, it puffs up, and burns with a very smoky flame.

2. *Myrrha naturalis seu in sortis* consists of the more impure pieces which remain after picking out the previous sort. We likewise meet in it with the impurities of the *Myrrha naturalis*, especially *bdellium*, further *gum-arabic* and cherry-tree gum moistened with tincture of myrrh, &c. The *bdellium* resembles the myrrh very much in appear-

ance, possesses a similar bitter taste, but a different, fainter odour, and is characterized by its great amount of bassorine.

3. *Myrrha Indica* (*Myrrha nova*).—Irregular fragments, frequently three inches thick, brownish white, greenish, sometimes nearly black, tear-shaped, opaque, with a waxy lustre. In odour and taste it resembles myrrh, but is more bitter.

Martius distinguishes a fourth kind, the *Myrrha alba*, which is sometimes found mixed with the other kinds; the fragments resemble *gum ammoniacum*, are more or less spherical, tear-shaped or angular, have a conchoidal fracture and a dull waxy lustre; the odour resembles that of myrrh; the taste is intensely bitter.

Myrrh was first minutely examined by Brandes in 1819; subsequently by Braconnot, Pelletier and Bonastre. The myrrh employed by the author in his investigation (*Myrrha nova*) consisted of irregular, knotty and roundish, tear-shaped fragments of about the size of a hazel-nut. It was of a wine-yellow colour, with a reddish tint, sometimes darker. The fresh fracture presented the lustre of wax, at some places that of resin, traversed by white opaque stripes and some spots of the same colour; its odour was peculiar and aromatic; its taste likewise aromatic and bitter. Spec. grav. 1.12—1.18. On pulverization it formed into little balls, and left on paper a fatty spot. It did not melt on the application of heat, but puffed up, giving off white aromatic vapours, and was soon reduced to a coal. It left 3.65 per cent. of a white ash, which consisted principally of carbonate of lime, with some carbonate of magnesia, a little gypsum and peroxide of iron. Brandes and Braconnot found potash and phosphoric acid, which the author could not detect. With concentrated nitric acid the myrrh became of a blackish-brown colour, the nitric acid acquired a dirty violet-red colour; after long-continued action the resin was decomposed, and an orange-red sediment separated. When heated with concentrated nitric acid, it became blackish-brown, with the separation of some violet-red flakes, which

however soon disappeared again, leaving behind an orange-red resinous mass. To determine the amount of water, 0.764 gms. of the powder was heated in a right-angled glass tube in the water-bath to 203° F. until no more moisture was given off. The fluid which escaped was clear, colourless, had a faintly-acid reaction, and amounted to 1.475 per cent. of the myrrh. The residue, which was half-fused, melted still more on the application of a stronger heat over a spirit-lamp, giving off a yellowish, turbid, strongly-acid liquid, on which floated some dark brown drops of an empyreumatic oil; at the same time a large quantity of yellowish-white vapours was given off.

15 gms. myrrh were heated with about 20 times the quantity of water in a retort until about half the liquid had passed over. When the apparatus had cooled, the upper portion of the retort and the recipient were found coated with a whitish resinous body, which was soft to the touch, but after a time became hard and brittle. The distillate was milky and deposited some yellowish-white flakes, but no traces of oil. The resinous coating was dissolved in alcohol after removal of the liquid, and left on slow evaporation a light brown solid resin, which dissolved entirely in alcohol, far the greatest portion in ether, and almost wholly in caustic potash, formed a blackish-brown mass with nitric acid, and was nearly insoluble in acetic acid. The gum of the myrrh had dissolved almost entirely during the distillation, so that very little was left on the filter. The nearly-clear filtered solution left on evaporation a brownish extract, which on treatment several times with warm spirit yielded a brownish mass. The alcoholic extract left on evaporation a soft resin, which was almost wholly soluble in alcohol, was not precipitated by water, and had an acid reaction. Ether scarcely altered it; nitric acid dissolved it to a clear reddish-brown liquid, which after a few hours became yellow; caustic potash afforded a clear brown solution with it, leaving behind a few flakes.

30 grms. of pulverized myrrh were exhausted with alcohol of 0.831 spec. grav. at a temperature of about 60° F. The dry residue formed a yellowish-white mass easily reducible to powder, of a faint odour and taste of myrrh; it amounted to 48.330 per cent. Amylum could not be detected in it by iodine. It dissolved in cold, but more readily in boiling water, and when filtered left a residue, from which alcohol still removed some resin, the quantity of which after complete exhaustion amounted to 3.862 per cent. of the myrrh. If we subtract the weight of these impurities, as well as that of the ash from that of the entire residue, there remains 40.818 per cent. for the gum, which is very closely allied to Arabin. The aqueous filtered solution yielded no coagulum on boiling, and left a gummy brittle body of vitreous lustre. The somewhat concentrated solution gave, when mixed with twice its volume of alcohol, a white turbidness; with protonitrate of mercury a white precipitate, soluble in an excess of the reagent; with pernitrate of mercury a white precipitate, insoluble in an excess of the precipitant; with neutral and basic acetate of lead a white precipitate; with perchloride of iron a transparent gelatine, and the same with borax. On boiling with nitric acid, the gum was converted into mucic and a little oxalic acid. The alcoholic extract was carefully distilled. When about half the alcohol had passed over, the contents of the retort became turbid, and deposited an oily body, which was separated and the distillation continued, when a further separation took place. To free this balsam-like body from water and alcohol, it was placed for several days over chloride of calcium under a bell-glass. There remained a clear brownish-red liquid, of the consistence of thin turpentine, and of a strong odour and taste of myrrh. Alcohol dissolved it again, and yielded on mixing with water an acid liquid. It was wholly dissolved by ether, was coloured chocolate-brown by cold nitric acid, and on the application of heat formed a porous yellowish-brown mass; the acid

became violet, and subsequently yellow. Acetic acid yielded a violet-red solution with it; caustic potash had very little action upon it. This resinous body presented on elementary analysis the following composition:

Carbon	-	-	77.130	22	= 77.40
Hydrogen	-	-	8.870	15	8.68
Oxygen	-	-	14.000	3	13.92

To ascertain the nature and amount of the ethereal oil, the alcoholic extract was distilled until the residue began to acquire a thickish consistence. After removal of the alcohol from the recipient, some grammes of water were added to the retort and the heat was increased; a faintly-yellow oil passed over with the aqueous vapour. The addition of water was renewed, and the distillation continued as long as perceptible traces of oil passed over. The residuary resin was on cooling brittle, clear, light brownish-red. Alcohol dissolved it almost wholly; with water it yielded a white turbid liquid, which had an acid reaction. In ether it was readily soluble; by nitric acid it became first violet, then brown; caustic potash had scarcely any action on it. The distilled oil of myrrh (*Myrrhole*) was of a light vinous-yellow colour, thick, and possessed a penetrating odour and taste of myrrh. After standing for some time exposed to the air, it became thicker and its colour darker; its quantity amounted to 2.183 of the myrrh; it was lighter than water, heavier than alcohol. Both ether and alcohol readily dissolve it. The composition of myrrhole is—

	I.	II.	Mittel.		
Carbon	79.820	80.150	79.985	22	= 80.440
Hydrogen	9.867	10.430	10.149	16½	9.920
Oxygen	10.313	9.420	9.866	2	9.640

It is remarkable that the per-centage composition of myrrhole agrees very nearly with that of colophony and of sylvic acid:—

	Colophony. (Blanchet and Sell.)	Sylvic Acid. (Liebig and Trommsdorf.)
Carbon	80.04	79.74 79.66
Hydrogen	10.01	9.82 9.82
Oxygen	9.95	10.44 10.52

The resin of the myrrh was obtained from an alcoholic extract by distilling off the greater portion of alcohol, and then evaporating it. A portion of the oil must still have remained with the resin. The latter was reddish-brown, transparent, brittle, of conchoidal fracture, and amounted to 44.760 per cent. of the myrrh. When heated, it gave off vapours with the odour of myrrh, readily took fire, and burnt to within a small trace of residue. Its melting-point is between 194° and 203° ; it dissolves wholly in ether, but only partially in alcohol; water produced a turbidness in the solution, which did not redden litmus-paper. Muriatic acid produced a flocculent turbidness. Boiling caustic potash dissolved it partially; acetic and sulphuric acids yielded with it a clear solution. It is therefore a neutral resin, and may be called *Myrrhine*. Its composition is—

	I.	II.	III.			
Carbon	71.960	72.840	72.760	72.400	21 =	72.24
Hydrogen	8.175	8.129		8.152	16	7.92
Oxygen	19.865	19.031		19.448	3	19.84

A small quantity of the resin was heated in a glass tube to 334° until it ceased to froth. The liquid which had collected at the other end of the glass tube was perfectly transparent, and of a strong acid odour and taste. A small quantity of a soft resinous body had deposited itself on the sides of the tube. When cold, the mass was dark reddish-brown, very brittle, transparent, possessed great lustre, but scarcely any odour or taste. Ether dissolved the resin almost entirely, and also alcohol; the latter yielded with water a turbid acid liquid. Nitric acid acquired with it a violet opalescence, and on warming became yellow. Sulphuric acid gave a clear reddish-brown solution with it. Since this acid resin is formed by fusion from the myrrhine, it may be called *myrrhic acid*. Elementary analysis gave—

	I.	II.			
Carbon	75.430	75.310	75.370	24 =	75.222
Hydrogen	7.946	8.063	8.005	16	8.250
Oxygen	16.624	16.627	16.625	4	16.528

According to this analysis therefore the myrrh contained in 100 parts—

Essential oil	-	-	-	-	-	2.183
Resin	-	-	-	-	-	44.760
Gum (arabine)	-	-	-	-	-	40.818
Water	-	-	-	-	-	1.475
Impurities	-	-	-	-	-	3.862
Carb. of lime with carbonate of magnesia						3.650
Some gypsum and peroxide of iron	-					

96.748

Myrrhole undergoes decomposition by exposure to the air, as does also the resin when heated either alone or with water. It is probable therefore that the *Extractum myrrhæ aquosum* contains an altered resin. It is also probable that the semiresin discovered by Brandes, and also that called by Bonastre subresin, were formed in the course of the analysis by the decomposition of the myrrhine. From the formulæ obtained, the transition of the oil into the resin is readily apparent. If we double the number of the equivalents we have—

Myrrh	-	-	-	-	-	$C^{44}H^{33}O^4$
Myrrhine	-	-	-	-	-	$C^{48}H^{32}O^{10}$
Myrrhic acid	-	-	-	-	-	$C^{48}H^{32}O^8$

The quantity of oxygen is, according to this, smaller in the acid resin than in the neutral one; the latter probably contains a portion of its oxygen and hydrogen in the state of water. The balsam is, at all events, a mixture of oil and resin, and forms the transition from the former into the latter.—*Lond. Chem. Gaz. from Archiv. der Pharm.*

ART. XLVIII.--ON THE PREPARATION OF PURE PHOSPHORIC ACID.

By DR. GREGORY.

DR. GREGORY states that he has not found the alcohol process for separation of the phosphate of magnesia, in the preparation of phosphoric acid (described in his recent work, p. 110,) to answer. He recommends the following as preferable:—

Having removed the lime by means of sulphuric acid, and evaporated the filtered liquid (filtering again if any sulphate of lime separates during the evaporation) to the consistence of syrup, a few drops of sulphuric acid are added, to make sure that no lime remains. Of course, if turbidity ensues, the lime has not been completely separated before; and the addition of sulphuric acid, filtration after adding some water, and evaporation, must be repeated till the syrupy liquid continues quite clear when sulphuric acid is added. This liquid now contains only the phosphoric acid, the magnesia, and the excess of sulphuric acid. It is concentrated, and heated in a covered platinum crucible until the whole of the sulphuric acid has been expelled, and the residue has acquired a low red heat. On cooling, it forms a glass, perfectly colourless and transparent, which contains only phosphoric acid and the magnesia of the bones. This glass when boiled with water dissolves rather slowly, but completely. When the solution is again concentrated in a capsule of platinum until most of the water is expelled, and the temperature rises to between 595° and 600° Fahr., it suddenly, while hot, becomes turbid, from the separation of a peculiar phosphate of magnesia. At the same moment the phosphoric acid begins to crystallize like the granular sugar deposited in honey, a form ascribed by Peligot to the bibasic or pyrophosphoric acid. If the same temperature

be kept up for 15 minutes, the whole of the magnesia separates in the form of a powder, which is quite insoluble in acids or water; when cold, the mass is digested with water, which dissolves the phosphoric acid, leaving the phosphate of magnesia as a heavy, fine, snow-white powder, of a faint silky lustre. *The filtered liquid is free from every trace of magnesia*, and may be considered as pure phosphoric acid. If the bones contain chloride of sodium, a trace of phosphate of soda will remain. In that case the burnt and powdered bones ought to be boiled with water, to remove any soluble chloride. Dr. Gregory recommends this process as a simple one for obtaining pure phosphoric acid. It is necessary to keep up the heat of about 600° for 12—15 minutes, but not to go beyond that temperature, because a stronger heat would again, no doubt, produce the glass formed in the first fusion, which as we have seen is entirely soluble in water. The acid is easily tested for magnesia by diluting and supersaturating with ammonia; when, if magnesia be present, it very soon appears as ammoniaco-magnesian phosphate. The phosphate of magnesia thus separated is a peculiar and anomalous salt. From six analyses Dr. Gregory induces the formula $2\text{MgO} + 3\text{PO}^2\text{O}^5$, that is, an acid sesquiphosphate of magnesia, according to the older notions of phosphoric acid. This composition cannot be reconciled with any of the three generally admitted modifications of phosphoric acid; and it would seem to indicate, either that another modification exists, or that the theory of phosphoric acid and the phosphates at present admitted is erroneous. Dr. Gregory is engaged in the examination of this point. The insolubility of the phosphate is very great, and presents a great obstacle; for boiling nitric acid, aqua regia, are almost entirely without action upon it; and it is, he believes, the only salt of magnesia insoluble in acids.—*Ibid from Med. Gaz.*

ART. XLIX.—ON A METHOD OF PURIFYING ARSENIFEROUS SULPHURIC ACID DURING ITS MANUFACTURE.

By M. ALPH. DUPASQUIER.

ARSENICAL sulphuric acid is prepared in several large manufactories in France and England by the calcination of pyrites (sulphurets of copper and of iron more or less mixed with sulphuret of arsenic and arseniuret of iron.)

From the experiments and observations contained in this memoir it results—

1. That the use of arseniferous sulphuric acid in the arts, and in the production of chemical and pharmaceutical preparations, may lead to serious disadvantages and danger.

2. That arsenic in the sulphuric acids of commerce is in the state of *arsenic acid*.

3. That the proportion of this poison in the acid varies, but that it may be estimated at about 1- or $1\frac{1}{2}$ -thousandth.

4. That the employment of hydrochloric acid or sulphuretted hydrogen is insufficient for the purification of arseniferous sulphuric acids.

5. That the use of alkaline sulphurets offers a complete and ready method for the purification of the arseniferous acids.

6. That the sulphuret of barium, both as regards economy and the purity of the sulphuric acid, is by far preferable to the other alkaline sulphurets, and it is moreover cheap and very easy to put in practice during the preparation of sulphuric acids in the manufactories.*

Ibid from Comptes Rendus.

*By the employment of this method, not only is the arsenic entirely eliminated, but the nitric acid is also necessarily destroyed, an acid which occurs in most of the sulphuric acids of commerce.

ART. L.—ON DIGITALIC ACID AND THE DIGITALATES.

BY M. PYRAME MORIN.

To prepare this acid, the leaves of the plant are to be treated with hot water; the infusion is acid, and is to be evaporated on the water-bath to the consistence of a thick syrup; to the residue a large quantity of alcohol is to be added until it produces no further precipitation; it is to be suffered to remain for some days till a deposit is formed, which ought not to be bitter, but which is so if the alcohol be too strong.

The liquid is then to be filtered, and distilled in a water-bath till it becomes a thick extract, which is to be treated with pure sulphuric æther, and kept at a moderate heat for an hour and eventually boiled; this operation is to be repeated several times.

The æthereal tinctures thus obtained are acid, and have a slightly greenish-yellow colour, especially the first portions. By this process the bitter principle, or digitaline, and the digitalic acid are dissolved; to this æthereal solution barytes in fragments is to be gradually added, which forms a yellowish precipitate, and when any remains insoluble, or the solution restores the blue colour of reddened litmus, enough barytes has been added.

The liquor, which contains only digitaline, but not perfectly pure, is then to be filtered. The precipitate is to be collected, which is to be washed with æther to remove all the bitterness, and then with alcohol, till it passes but slightly or not at all coloured.

The precipitate is to be diffused through cold water and mixed with sulphuric acid to precipitate the barytes; and it is better to leave some digitalate of barytes undecomposed than to add too much acid. By filtration, a strongly acid,

reddish-coloured solution is obtained ; this is to be slowly distilled in a glass retort in order to separate much of the water, and care is to be taken that the heat is not too great. On cooling, a small quantity of a brown substance decomposes, the clear liquor is to be poured off, and sufficient alcohol is to be added to it to precipitate any digitalate of barytes which may have escaped decomposition ; by evaporating the liquor *in vacuo*, crystals are abundantly formed.

In all these operations it is requisite to avoid the contact of air as much as possible, for the digitalic acid is converted by it into a brown substance : notwithstanding the evaporation *in vacuo*, the formation of this substance cannot be prevented, and the crystals are consequently formed in a liquid of a deep colour ; the more the action of the air is prevented, the purer are the crystals obtained. The crystals are to be separated by and pressed between filtering paper, dissolved in a small quantity of alcohol, and again crystallized *in vacuo*, by which they are obtained white.

The properties of digitalic acid thus obtained are, that it crystallizes in long needle-form crystals ; it possesses a slight peculiar odour, which is increased by heat, and it yields a suffocating vapour, a small quantity of which occasions coughing ; at a higher temperature it melts, becomes black, and burns with a white flame ; it leaves a charcoal which readily burns without residue ; no ammonia is produced during the decomposition by heat.

The acid when pure is perfectly white ; but the action of light, heat and air upon it is very great, readily converting it into a brown product, which colours the solution, and from which it is difficult to free it, and on this account the greatest care must be taken during its preparation. When the acid is dissolved in a small quantity of water, it may be converted during evaporation by the water-bath into a deep-coloured substance : this is itself acid, insoluble in water, slightly soluble in æther, and readily so in alcohol.

Digitalic acid becomes still more readily brown by the

action of alkaline bodies ; thus in preparing it, excess of barytes must be avoided.

Digitalic acid has a sour but not disagreeable taste ; it immediately reddens litmus paper, expels carbonic acid from carbonates, and forms digitalates, and combines directly with basic oxides, and the soluble salts which it forms become readily yellow in the air.

M. Morin states the properties of the following digitalates:

Digitalate of Soda.—Obtained by exactly saturating the acid with carbonate of soda, and evaporating the solution under the air-pump vacuum. It is white, and crystallizes very well, but by exposure to the air it becomes quickly yellow, and so also does the solution. It is very soluble in water.

Digitalate of Potash.—Obtained by decomposing the carbonate in the same way as the preceding. It crystallizes with difficulty and is very soluble in water.

Digitalate of Magnesia.—Obtained from the acid and carbonate of magnesia ; soluble in water.

Digitalate of Barytes.—Obtained by saturating the acid either with barytes or the carbonate. It is soluble in water but insoluble in alcohol and in æther. Quite colourless, but by exposure to air and heat it becomes brown.

Digitalate of Lime is obtained in the same way as the barytic salt, with which it has great analogy ; being insoluble in alcohol and in æther, it may be employed for the preparation of digitalic acid.

Digitalate of Zinc.—Obtained by treating the carbonate with digitalic acid ; the filtered solution is to be evaporated by the air-pump vacuum.

This salt is formed notwithstanding an excess of carbonate. It is obtained at first as a transparent salt, having the appearance of a thick solution of gum ; but after some days a number of small arborescent crystals are formed. This salt does not so quickly become yellow by exposure to the air as those previously described.

Digitalate of Lead.—A white, heavy, insoluble salt.

Digitalate of Copper.—A greenish, soluble salt.

Digitalate of Silver.—A white salt, insoluble in water, but soluble in nitric acid.

A solution of digitalate of soda gives, with protosulphate of iron, an abundant flocculent precipitate; with the peracetate of iron it produces no effect; these reactions prove, according to the author, that digitalic acid cannot be mistaken for gallic acid.

This acid exists, probably, uncombined with digitaline, for after having treated the watery extract with alcohol, an abundant brown precipitate is obtained, which is devoid of bitterness, but possesses an acid reaction, and digitalic acid may be obtained from it.

M. Morin observes, that the peculiar properties of digitalic acid, as such, appear to him to be sufficiently established; though it may, he states, be objected, that it is formed under the influence of the substances, especially of barytes, employed to obtain it; but to this objection it is replied, that the juice of the digitalis possesses an acid reaction as soon as it is procured; that the dry leaves treated with water, alcohol, or æther also yield acid solutions; if the alcoholic or æthereal solution, obtained during the preparation of the acid, be saturated with oxide of lead, the liquor remains bitter, and a precipitate is formed; if this be washed in the water and alcohol, and then treated with hydrosulphuric acid, the excess of which is to be expelled, a very acid solution is obtained, from which digitalic acid is obtained by crystallization. This process the author thinks may, perhaps, be better than that which he has described, unless it be wished to obtain the bitter principle at the same time; in this case the action of the base employed is not sufficiently energetic to allow of the formation of a secondary product; the same effect may be produced with carbonate of lead.—*Ibid, from Journ. de Pharm. et de Ch.*

ART. LI.—ON SULPHUROUS ÆTHER.

By MM. EBELMEN and BOUQUET.

IN the action of alcohol on the chloride of sulphur, a new æther, sulphurous æther, is produced under the following circumstances:—When absolute alcohol is poured over protochloride of sulphur, disengagement of heat results, with formation of hydrochloric acid gas and a deposit of sulphur. On continuing to add alcohol until all reaction has ceased, and then distilling the mixture, there first passes over at about 176° an abundant product, which is nothing further than alcohol acidified by hydrochloric acid. On continuing the application of heat, the temperature of the liquid rises rapidly, and is rendered clear by the fusion of the sulphur which it held in suspension, becomes of a brownish-red colour, and parts between 302° and 338° with a product, which is collected separately. There remains in the retort a considerable deposit of fused sulphur.

The liquid, distilled between 302° and 338° , having been rectified until its boiling-point remains constant, a limpid colourless fluid is obtained, of a peculiar æthereal odour, somewhat analogous to that of mint; its taste is at first cooling, then burning, and it has a sulphureous after-taste. It boils at 322° ; its density is 1.085; it dissolves in every proportion in alcohol and in æther at 61° . Water causes a precipitate in these solutions, and redissolves the deposit only very slowly, acquiring a very strong odour of sulphurous acid.

The æther, which had been prepared for some time and preserved in badly-corked bottles, likewise underwent an analogous decomposition from the action of the moist air.

The analysis of this product has led to the formula SO^2 , $\text{C}^4 \text{H}^5 \text{O}$, which represents two volumes of vapour. The

calculated density would be 4.76; the experiment yielded an almost identical number, 4.77.

To complete the history of this body, we have yet to study the action of chlorine on it; this gas is absorbed in large quantity under the solar influence, but the state of the weather has not as yet permitted us to obtain the definitive product of the reaction.—*Ibid from Comptes Rendus.*

ART. LII.—ON THE ROOT OF COHATE, A NEW DIURETIC MEDICINE.

By M. ARNOZAN.

THE rhizome of cohate, furnished by a vegetable of the family of the graminaceæ, presents, like the suckering of monocotyledanous plants, approximated and converging nodiform divisions: it sometimes presents remains of radical leaves, thick and fleshy fibres; its external colour, of a reddish brown, seems to denote that it must grow in a ferruginous soil. The plant itself reaches nearly to the height of a man, and is sometimes in advance of the bark of thick woods.

Masticated and held for some time in the mouth, this root at first insipid, manifests an aromatic taste, which arises from its bark. M. Arnozan had an opportunity of examining old and recent roots, and both qualities presented the same characters.

In examining this sample of cohate in a qualitative point of view only, this pharmacien found in it gum or mucous matter, starch, an insipid waxy substance, soluble only in alcohol, and a resinoid matter, possessing the same color as the root, and an evidently aromatic taste; it is the latter

substance which he considers as the native principle of the root.

In comparatively examining the results of different treatments by water, with and without heat, by alcohol, and by ether, the decoction alone seemed to combine all the qualities indispensable to an efficacious medicine, as regards both the possibility of being administered easily, and the advantage of being charged with all the active principles of the root. It is, moreover, the popular mode followed for the employment of this remedy in Havannah, where the decoction is taken as a draught.

According to the statement of several persons who have witnessed the use of this root in the island of Cuba, cohate enjoys diuretic properties, which seem to be more prominent in it than they ordinarily are in the roots of other vegetables of the same family; it is also highly extolled as a remedial agent in cedematous affections; it is even regarded as the only remedy which can be efficaciously employed for the negroes coming from the coast of Africa, who are, for the most part, dropsical at the time of their arrival; and its employment is so general, especially in the habitations, that the colonies are constantly provided with it, and cultivate it on purpose.

M. Arnozan mentions that, some years ago, a woman who was engaged, near Bordeaux, in the cultivation and collection of medicinal plants for pharmaceutical purposes, received a certain quantity of this recent root in order to try to cultivate it. The attempt was not successful; but the woman, who knew the therapeutical properties of cohate, administered a draught of it to a dropsical person, who experienced great benefit from it. This patient continued to use it for three years, and always with evident advantage.

Since the communication made by M. Arnozan to the *Société de Médecine de Bordeaux* on the properties of cohate, Dr. Pereira has given a draught prepared with 2 grammes of this plant to 2 quarts of water reduced to half, to a man

attacked by disease of the heart, and presenting a very intense leucophymasia, and the diuretic effect of the new medicine was powerful.—*The Chemist, from Journ. de Med. de Bordeaux.*

ART. LIII.—BERZELIUS ON THE URINE.

THE distinguished Swede, after giving a most elaborate account of the composition of this animal fluid, proceeds to point out how much its composition is affected by a variety of substances when taken into the stomach. The following examples will abundantly prove the truth of this remark.

After the free use of mercurial ointment, the urine is found to contain salts of this metal in minute quantities. To detect their presence, we have only to dry the sediment that is precipitated, and then to calcine it: globules of mercury may thus be obtained.

Nitre, the yellow prussiate of potash, and many metallic salts, especially those of iron, may readily be dissolved in the urine not long after they have been swallowed.

After the employment of large quantities of any ferruginous preparation, the urine sometimes acquires a feeble bluish or greenish hue—owing, says Berzelius, to the union of the iron with the ferrocyanic acid, which may be generated by the decomposition of different animal matters within the body itself.

Soon after tartaric or oxalic acid has been taken into the stomach, the urine often deposits, as it cools, oxalic or tartrate of lime—a deposit that is increased by the addition of the chloruret of lime to the fluid. The malic, citric, and tartaric acids render the urine more or less decidedly acid.

Succinic acid also reappears in the urine. Not so, however, with the benzoic acid; for this seems to become transformed within the organism into hippuric acid—according to the observations of Wöhler, Boyé, and Leaming.

The infusion of nut-galls is known to pass into the urine; for a black precipitate is found to be formed on the addition of ferruginous solution. After the administration of odine, the iodurets of potash and ammonia are discoverable. The alkaline carbonates also, the borates, silicates, and the chlorates may be detected by the addition of their respective reagents. The same holds true of the yellow prussiate of potash; the red prussiate is converted into yellow. The sulphuret of potassium is absorbed in part only, without alteration; part becoming oxydised during the circulation, and converted into a sulphate.

The vegetable salts, having potassa and soda for their bases, are transformed into carbonates; for the urine is then found to be alkaline, and to effervesce on the addition of an acid. The same phenomenon is often observed when a person has been eating very freely of certain fruits, as apples cherries, strawberries and raspberries, which contain the malate or the citrate of potassa. This fact explains the utility of these fruits occasionally as a remedy in uric acid gravel.—*Ibid, from Journal de Pharmacie.*

ART. LIV.—ON CARRAGEEN MOSS.

By. M. E. MOUCHON.

M. E. MOUCHON, pharmacien at Lyons, has published in a recent number of the *Journal de Chimie Médicale*, several formulæ intended to facilitate the administration of carrageen, and consequently to extend its therapeutical em-

ployment. Carrageen is a substance which, without contradiction, deserves the attention of practitioners, on account of the abundance of its gelatinous, demulcent, and nutritious principle; moreover, the formulæ of M. Mouchon appear so rational that we hasten to lay them before our readers.

1. *Gelatine of Carrageen.*

Carrageen was submitted to three successive decoctions to almost completely exhaust it of its gelatinous matter, then the decoctions were evaporated on sand-baths, in a glazed saucepan to the consistence of a thick syrup, and the concentration was finished on the stove to almost perfect dryness, in moulds of white iron, covered with a thin layer of cacao butter, and furnished with gelatine, in such a manner as to form thin, transparent, and easily pulverised plates, especially by mixing the matter with sugar.

One gramme (15½ grains) forms 180 grammes of water into a jelly, and constitutes with 90 grammes of water, and as much sugar, an equal quantity of a sufficiently consistent product.

2. *Saccharide of Carrageen.*

To obtain this product we have only to add to the gelatinous liquid, concentrated to the consistence of a thick syrup, four times as much sugar as carrageen. The operation is completed in a sand-bath, care being taken to stir the syrup often until every portion may easily be powdered.

3. *Tablettes of Carrageen.*

R—Saccharide of carrageen,	500 grammes.
Gum tragacanth,	4 “
Common water,	45 “

M. and F.S.A. tablettes of 2 grammes, which may be aromatised at will.

4. *Syrup of Carrageen.*

R—Carrageen,	30 grammes.
Spring water,	2,000 “

The carrageen is exhausted by boiling for half an hour, strained with pressure, and

Simple syrup of 30°	4,000 grammes
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are added.

The mixture is heated to reduce it to the weight of the syrup employed.

This syrup appears to be able to be substituted with great advantage for syrup of gum arabic. It has a certain analogy with syrupum *helicii*s and with syrup of gum tragacanth, which may possess in certain respects the same medicinal properties.

5. *Paste of Carrageen.*

R —Carrageen,	123 grammes.
Common water,	12,000 “

It is boiled for half an hour with two-thirds of the water, and strained, and the residue is submitted to a second decoction with the remaining water. After new pressure, the two decoctions are united, and there is added to them

White gum Senegal,	1,000 grammes,
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which must be rapidly mixed in and dissolved with heat. The solution is strained; and there is added to it,

Loaf sugar,	1,000 grammes,
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then the product is exposed to the long-continued action of a boiling hot sand-bath; and when it is judged sufficiently concentrated, it is laid in thin layers in moulds of white iron, on the surface of which cacao butter has been spread. The concentration is finished in a good oven, which completes it in a few days to such a point that the paste may easily be detached.

This paste which is very agreeable to the taste, especially when it is aromatised with tincture of orange or any other aromatic, may be compared to the paste of lichen, and deserves even to be preferred to it.

6. *Jelly of Carrageen.*

R —Carrageen,	2 grammes.
Common water,	250 “

It is boiled for half an hour, strained with pressure, and there is added to it,

Sugar, in pieces, 40 grammes.

It is concentrated until the solution is reduced to 125 grammes, which is again strained, and aromatised with a few drops of tincture of orange or lemon.

This jelly has the advantage of being preserved intact for a very long time. When it is prepared without sugar, it contracts, after being kept a few days, a slight fishy taste; but this never occurs when sugar has been added.—*Ibid*, from *Gazette des Hôp.*

ART. LV.—EXAMINATION OF THE VIEWS ADOPTED BY
LIEBIG ON THE NUTRITION OF PLANTS. Read before the
Botanical Society of Edinburgh, Feb. 13, 1845.

By DR. SELLER.

DR. SELLER contrasted Liebig's view of the mineral nature of the food of plants with that which represents their food as organic, and traced out the consequences deducible from this last hypothesis as affecting not merely the vegetable, but the animal kingdom also, the latter being ultimately sustained solely by vegetable substances. He showed that, whereas the view adopted by Liebig in nowise restricts the duration of the organised kingdoms, so long as they remain exempt from the influences of destructive agencies from without, the opposite view involves the conclusion that the whole of organic nature is hastening rapidly to dissolution from inherent causes; and he affirmed that were certain data somewhat more carefully considered, the period of the final extinction of plants and animals, in accordance with this hypothesis, might be pretty nearly determined.

He regarded this question as one not merely of high interest in itself, but as bearing expressly on the solution of the problem, whether the food of plants be organic or mineral. Dr. S. calculates the annual conversion of the carbon of organic matter into inorganic carbonic acid at not less than 600,000,000 tons; and infers, on the most favorable aspect of the amount of soil over the earth's surface, that such an annual loss could not be withstood beyond 6,000 years; and, on a less exaggerated assumption of its amount probably very near the truth, that the waste would absorb the whole of the existing organic matter of the soil in about 740 years.

Dr. S. contends that the truth of these conclusions remains unaltered, even if it be conceded that much of the carbon of plants is drawn, not from the organic matter of the soil, but from the inorganic carbonic acid of the atmosphere, unless some inorganic source of their hydrogen and oxygen be at the same time admitted. He therefore regards Liebig's views of the inorganic nature of the food of plants as supported, not merely by many special facts—for example, by the increase of the organic matter of the soil, often observed during the growth of plants—but also by the general view of the earth's surface just taken, because there is nothing in its aspect to warrant the idea that its means of maintaining the organic kingdoms are declining with the rapidity indicated in the statements just made.

He next examined Liebig's views of ammonia.

1st. As the sole source of the nitrogen of plants, and thereby of animals.

2d. As having its exclusive origin from the interior of the earth, and never from the nitrogen of the atmosphere. In regard to these statements he made it appear, as there is no evidence of ammonia being thrown forth from the bowels of the earth at all times, in quantities proportioned to the waste of it necessarily sustained at the surface, by decomposition into uncombined hydrogen and nitrogen, that Lie-

big's view of ammonia infers the same limitation of the existence of the organic kingdoms to a few thousand years, as is deduced from the hypothesis of organic matter being the food of plants.

Here, therefore, he differed from Liebig, contending that ammonia must be produced from the nitrogen of the atmosphere, and showing the probability of what is taught by Professor Johnson, namely, that the nitrogen of nitrates formed from the atmosphere, is fixed by plants, as well as the nitrogen of ammonia. In conclusion, he reviewed the evidence of potassa, the phosphates, and the other saline matters, of both organic kingdoms, being derived originally from the crumbling of rocks, and dwelt on the retardation of vegetable physiology, by the long scepticism of botanists on this head, owing, as he believed, to their distrust in the conclusions of chemistry; and went on to show that chemistry must be the ground-work of vegetable physiology in its present stage, and that the frequent changes in the aspect and nomenclature of chemistry did not materially affect the facts which it daily affords for the elucidation of the vegetable economy.—*Chemist*.

ART. LVI.—EXPERIMENTS ON THE PREPARATION, PROPERTIES AND COMPOSITION OF VALERIANIC ACID AND SOME OF ITS SALTS.

By DR. C. G. WITTSTEIN.

VALERIANIC acid, the salts of which have of late been so much recommended, is, as is well known, not solely a natural constituent of valerian, but is likewise formed artificially in various chemical reactions upon organic bodies;

for instance, in the action of caustic potash upon potato fusel oil. Admitting however that the artificial acid is perfectly identical in a therapeutical point of view with the natural, yet the most advantageous method of obtaining it appears for the present still to be from the plant.

Preparation.—The author brings for this purpose 20 lbs. ($18\frac{2}{3}$ oz.) of dry and finely-cut valerian root with 100 lbs. of water into a copper still, and draws off 30 lbs. The recipient employed is a Florence flask, in order not to lose the æthereal oil, which constantly amounts to 3— $3\frac{1}{4}$ oz. for every 20 lbs. of root. 30 lbs. more water are added to the residue in the still, as much drawn off, and this addition and distillation repeated once more. The root is then so exhausted that what passes over no longer reddens litmus; the contents of the still, however, turn litmus red; but this does not arise from valerianic acid, but from another non-volatile organic acid. No addition of acid, as recommended by Rabourdin to liberate the valerianic acid, is consequently requisite. The three aqueous distillates are saturated after removal of the essential oil with carbonate of soda, evaporated in a copper vessel to within a few pounds, then filtered and evaporated to dryness on a sand-bath in a counterpoised porcelain dish. Having ascertained by weighing the amount of valerianate of soda, it is dissolved in an equal weight of water, poured into a retort of 6 to 8 times the capacity, and a mixture consisting of 1 part concentrated sulphuric acid and 2 of water added, so that there be 4 parts of concentrated acid for every 5 parts of dry valerianate of soda. The soda instantly combines with the acid, forming sulphate of soda, and the liberated valerianic acid floats as a brown oil on the saline solution. By distillation in the sand-bath it passes over along with the greater portion of the water. The contents of the recipient are emptied into a tall cylinder, left some time in quiet, and the oily acid separated from the subjacent aqueous layer; the aqueous solution is likewise preserved, being a concentrated

solution of the acid. To concentrate further the acid thus obtained, which is still combined with 3 equiv. water, it is submitted alone to fresh distillation; and as soon as the liquid which passes over appears in clear drops and not turbid, the receiver is to be changed; what now distils over is the monohydrated acid.

Pure valerianic acid is a colourless or pale yellow liquid, resembling an essential oil, of a penetrating odour, somewhat different from the æthereal oil of valerian, and of very acrid, acid, disagreeable taste, calling to mind that of valerian. It floats on water, which dissolves 1 part in 26. The solution has a strong acid reaction, and possesses a somewhat mild and sweetish taste. Its combinations with bases, for instance with soda, have a sweet but at the same time valerian-like taste. It dissolves readily in strong alcohol and in æther. It is perfectly volatile, and when heated in a platinum spoon burns with a luminous flame. Its composition in the anhydrous state corresponds, according to Ettling and Trommsdorff, to the formula $C^{10}H^9O^3$. The first hydrate contains 1 equiv. water. To determine the composition of the second hydrate, a solution of 30 grs. of carbonate of soda was added to 60 grs. of the oily acid, carefully evaporated and dried a little below 212° . The dried salt weighed 65.5 grs.; on treatment with alcohol of 0.833 spec. grav., 3.4 grs. carbonate of soda remain undissolved, so that the quantity of valerianate of soda formed amounted to 62.1 grs.; consequently the 60 grs. of the oily acid contained 46.63 grs. acid and 13.37 grs. water, or 77.718 per cent. acid and 22.282 water, consequently 1 equiv. acid to 3 equiv. water.

Valerianate of Quinine.—1 part of oily valerianic acid is dissolved in 60 parts water, and 3 parts of pure (recently precipitated is best) quinine added, heated nearly to boiling, filtered while hot, and then placed in a cold situation. The crystals which have separated in the course of a few days are removed, and the liquid concentrated at a temperature below 122° . About 5 parts of the salt are obtained.

The aqueous solution of the acid dissolves the quinine with great readiness to the amount of 2 equiv. If, during the concentration, the temperature exceed 122° , oily patches are formed, which solidify on cooling to amorphous resinous masses, contain less water than the crystallized salt, and are scarcely soluble in water. The salt crystallizes in colourless rhomboidal tablets, with a slight mother-of-pearl lustre, or in white opaque radiately-grouped needles, has a faint odour of valerianic acid and a very bitter taste. It is not altered by exposure to the air, becomes tenacious when heated, melts to a colourless liquid, and is then converted into the above-described hydrate. When heated more strongly, it gives off white vapours, takes fire and burns without leaving any residue. It dissolves in 110 parts cold, 40 parts boiling water; in 6 parts cold, and in equal parts of boiling alcohol of 0.863 spec. grav.; likewise in æther. All its solutions have a neutral reaction. The amorphous hydrate scarcely dissolves in 1000 parts water; it however imparts to it a bitter taste. In alcohol and æther it dissolves just as easily as the crystallized salt. 20 grs. of the crystals dissolved in water gave, on treatment with a solution of caustic soda, 10.84 hydrate of quinine = 10.271 quinine. The alkaline solution was saturated with carbonic acid, and evaporated to dryness. From this residue alcohol of 0.833 spec. grav. dissolved out 4.0 grs. valerianate of soda. The composition of the salt is therefore—

	Found.	Equiv.	Calculated.
Quinine	51.355	2	51.411
Valerianic acid	14.980	1	14.719
Water	33.665	24	33.870

The resinous body separated by boiling the aqueous solution was reduced to a fine powder and dried at a gentle heat. Treated in the above manner, the salt gave—

Quinine	71.855	2	71.629
Valerianic acid	20.225	1	20.505
Water	79.20	4	6.860

According to the Prince of Canino, the quinine salt consists of equal equivalents; he has, however, taken Regnault's atomic weight of quinine, which is just as high again. The quantities, however, found by him are, according to the author, far too low.

Valerianate of the Peroxide of Iron.—60 parts of water are added to 5 parts oily valerianic acid and saturated with carbonate of soda, the solution boiled to expel all the carbonic acid, and left to cool. 3 parts perchloride of iron ($\text{Fe}^2\text{Cl}^3 + 6\text{HO}$) are then dissolved in 100 parts water, and the cold solution of valerianate of soda added to it until no further turbidness results. The precipitate is washed with a little water, and dried at a temperature not exceeding 68° ; at a higher temperature it loses a part of its acid, and on boiling the whole of it goes off. The salt forms a dark tile-red, loose, amorphous powder, which has a faint odour and taste of valerianic acid. Heated slowly, it parts without melting with the whole of its acid; heated rapidly, it fuses, and the acid is volatilized in thick inflammable vapours; but in this operation it undergoes decomposition, for the vapours smell of butyric acid; the residue consists of pure peroxide of iron. It is not moistened by cold water; boiling water gradually extracts all the acid, and leaves behind pure hydrate of peroxide of iron. The salt dissolves readily in hydrochloric acid; the dilute solution is not rendered blue by ferrocyanide of potassium; the peroxide of iron is consequently not reduced to protoxide by the valerianic acid. 20 grs. of the salt boiled with a solution of 10 grs. anhydrous carbonate of soda gave 5.40 grs. peroxide of iron and 18.95 valerianate of soda; therefore in 100 parts—

Peroxide of iron	27.00	3	26.315
Valerianic acid	71.00	7	71.720
Water	2.00	2	1.965

From this we may construct the formula $3\text{Fe}^2\text{O}^3 + 7\bar{\text{V}}\text{a} + 2\text{HO}$, or $7(\text{Fe}^2\text{O}^3 + 3\bar{\text{V}}\text{a}) + 2(\text{Fe}^2\text{O}^3 + 3\text{HO})$. The atomic weight is 11400 or 34200. The precipitate is con-

sequently a basic salt; the 2 equiv. acid wanted to produce a neutral salt are replaced by 2 equiv. water.

Valerianate of Zinc.—1 part oily valerianic acid is dissolved in 180 parts water, and to the solution $\frac{1}{4}$ part of recently-precipitated carbonate of zinc added; the whole is then digested for some hours at a very gentle heat, filtered after cooling, and concentrated at a very gentle heat. The salt separates on the surface in white snow-like aggregations. If the ley be boiled, a portion of the salt adheres firmly to the bottom of the vessel. It crystallizes in snow-white, extremely light laminae, with a mother-of-pearl lustre, similar to boracic acid, is not altered by exposure to the air, has a faint odour of the acid, and an astringent metallic taste, at the same time resembling that of valerianic acid. When heated on platinum foil, it melts, disengages thick white vapours, then takes fire, burning with a bluish flame, and finally leaves pure oxide of zinc, of which however a portion is volatilized during the combustion, owing to a partial reduction. It dissolves at the ordinary temperature in 160 parts water and in 60 parts alcohol of 0.833 spec. grav. The solutions have an acid reaction, become turbid on the application of heat, but become again clear on cooling. Cold æther takes up only 1-500th; boiling, on the contrary, 1-20th of the salt.

The analysis was executed precisely in the same manner as that of the valerianate of iron. 20 grs. yielded 5.9 grs. oxide of zinc and 14 grs. valerianic acid; consequently in 100 parts—

Oxide of zinc	29.50	1	30.08
Valerianic acid	70.00	1	69.92

The atomic weight is 1672. The salt contains no water.

Chem. Gaz. from. Buch. Rep.

ART. LVII.—ON A NEW METHOD OF PREPARING CHLORATE OF SODA AND CHLORATE OF BARYTES.

By DR. C. G. WITTSTEIN.

WHEN carbonate of soda is treated with chlorine, the chlorate of soda formed cannot be separated by crystallization from the chloride of sodium in the same manner as with the corresponding potash compound, both salts being soluble in nearly equal proportion in water. Nor can their separation be well effected by spirit, since 1 part of the chlorate of soda requires for solution 34 of alcohol, while 1 part chloride of sodium requires 260. When 1 equiv. chloride of sodium is mixed with 6 equiv. lime, and chlorine passed through, not a trace of chlorate of soda is obtained, but the chloric acid generated remains in combination with the lime. The usual method of preparing the chlorate of soda is to mix chlorate of potash with bitartrate of soda, separating the bitartrate of potash by filtration and crystallizing the solution. The chlorate of soda, however, so obtained contains tartrates, as may be seen by its becoming black when heated. As these methods of preparation are by no means advantageous, the author advises the following plan:—3 parts of crystallized sulphate of ammonia and 3 parts of chlorate of potash are dissolved in a porcelain dish in 15 parts hot water, and evaporated over the water-bath to the consistence of a thin paste, being constantly agitated. This paste is then conveyed into a glass flask, 4 times its weight of alcohol of 0.833 spec. grav. poured over it, digested for a day at a gentle heat, filtered, and the residuous saline mass washed with spirit. A fourth part by weight in water is now added to the mixed fluids, the spirit distilled off, the residue diluted with an equal weight of water, 5 parts pulverized, crystallized carbonate of soda added, and when no more ammonia is disengaged, evapo-

rated on the water bath to dryness. The salt obtained is dissolved in twice its weight of water and crystallized.

On mixing sulphate of ammonia and potash, sulphate of potash and chlorate of ammonia are formed, the former of which is not dissolved by the spirit. Since on careful evaporation of the aqueous mixture a small portion of the chlorate of ammonia is unavoidably decomposed, somewhat less carbonate of ammonia has been given in the above directions than required by theory. By the action of the carbonate of soda on the chlorate of ammonia, carbonate of soda is formed, and the residue is chlorate of soda.

In the same manner chlorate of barytes may be prepared with advantage, only in this case caustic barytes must be employed. A hot solution of barytes, prepared from crude materials (sulphuret of barium and oxide of copper, nitrate of barytes and iron-filings) answers very well; an excess of barytes does no harm, because it is converted into carbonate on evaporation; should, however, the residue still be alkaline, a current of carbonic acid may be passed through the solution.—*Ibid from Ibid.*

ART. LVIII.—ON AQUA REGIA; ON HYPOSULPHURIC ACID AS A MEANS OF OXIDATION; ON THE CONSTITUTION OF THE SAME ACID, AND THE PART IT ACTS ON BEING PUT IN CONTACT WITH ORGANIC SUBSTANCES.

By DR. KÈNE, Professor of Chemistry, at Brussels.

1. Aqua Regia may serve as one of the most powerful agents either for oxidising, acidulating, or dissolving a great number of simple and compound bodies. Important, however, as this substance is, on account of the above uses, and

interesting as are the phenomena attending its action, the nature of the same is still but incompletely known.

2. Berthollet attributes the properties of aqua regia to the formation of chlorine and nitrous acid.

3. This hypothesis was adopted by Sir H. Davy, who, after having mixed hydrochloric acid with nitrous acid, obtained a liquid, which did not possess the properties of aqua regia.

But in the days of Davy hyposulphuric acid was not known. The English chemist, therefore, may have operated with this acid, which seems the more likely, as several French chemists, at the instance of Professor Dumas, regard this acid as a compound radical, as an oxidising agent less powerful than nitric acid, capable of replacing hydrogen in some organic substances, which contain more than one equivalent of this metalloïd (hydrogen.)

4. Finally, Millon considers nitrous acid as the most powerful oxidizing agent of all the stages of oxidation of nitrogen—an hypothesis which leads to the assertion that the hydrogen of hydrochloric acid may destroy the nitrous acid, as the same metalloïd may deoxidise nitric acid.

5. We have, therefore to ascertain whether hydrochloric acid reduces nitric acid to hyponitric acid, to nitrous acid, or to binoxide of nitrogen.

6. If it could be proved that nitrous acid, of all the three oxyacids of nitrogen, is the most powerful oxidising agent, we might give preference to the latter hypothesis. But, recollecting the observations made by Davy (3,) and considering the oxidising power of the hyponitric acid, the formation of which, by the reaction of oxide of nitrogen on nitric acid, precedes the production of nitrous acid, we arrive at the conclusion, that hydrochloric acid can reduce nitric acid only to the state of nitrous acid.

7. The constitution, however, of oxysulphuric and analogous acids leads us to suppose that hyposulphuric acid is a radical; but, on the other hand, the formation of hydrochloric and

nitric acids, by mixing water with a solution of chlorine in hyponitric acid, is rather in favour of the assertion, that aqua regia is the result of a *mutual action* between the elements of the hydracid and those of the oxyacid— $(\text{H}^2\text{Cl}^2) + (\text{N}^2\text{O}^4 + \text{O}) = (\text{H}^2 + \text{O}) + (\text{N}^2\text{O}^4 + \text{Cl}^2)$. According to which, therefore, water and oxychloro-nitric acid are formed, the latter of which is little stable, and, like analogous acids, is decomposed in the presence of water. The latter hypothesis having been preferred to the two others, it was contemplated to allow an excess of gaseous hydrochloric acid to act on concentrated nitric acid. But by the mutual action of the said acids water is formed, the quantity of this liquid, however, gradually augments and is opposed to the complete decomposition of the acids; wherefore, in order quantitatively to determine the hydrochloric acid, the elements of which combine with those of the nitric acid, it was necessary to protect the acids from the influence of water during the time of their mutual action—that is, to employ a liquid which combines with water the moment it is formed, taking care at the same time that this hygroscopical substance be of such a nature as not to exert any injurious influence on the reaction, by which the latter might be rendered incomplete.

8. Sulphuric acid may answer this purpose. This combination, *if present in great excess*, possesses, in addition to this, the property, at the temperature of the disengagement of chlorine, of retaining in solution the hyponitric acid and the nitrous acid, a property indispensable for the demonstration, as an excess of hydrochloric acid is necessary to replace the whole of the nitric acids employed, and this excess, therefore, must be determined.

9. This determination requires that the influence of the chlorine be rendered inefficient, the quantity of which in a free state, under these circumstances, cannot be determined, as the chlorine in its free state, before it can be completely disengaged, under the influence of heat, from its solution in

sulphuric acid, red vapours are formed. These vapours, on entering into an aqueous solution of chlorine, would re-produce hydrochloric acid and nitric acid.

10. In the present case, therefore, the hydrochloric acid must be determined by the process which I have communicated in another article.

After these preliminaries, I might pass on to the description of the apparatus I employed, the process adopted, and an infinity of precautions taken, in order accurately to determine the amount of hydrochloric acid, which was not acted upon by the nitric acid, the amount of real acid of which having been previously ascertained; the analyses, however, instituted with various quantities of substances have led to results disagreeing with the theory indicated; this description would, therefore, be useless. Although it is true that in similar analyses very considerable losses are unavoidable, it is nevertheless a fact, that if the loss amounts to more than half an equivalent of hydrochloric acid, the cause must be sought after, not in the complication of the apparatus, or of the analysis, but in some other circumstance.

11. As this cause may be supposed to be the deoxidation of the hyponitric acid induced by the action of the hydrochloric acid on it, five grammes of well-dried nitrate of lead were heated, and the vapours of hyponitric acid thus disengaged were directed into 100 grammes of pure and concentrated sulphuric acid. The gaseous hydrochloric acid gas was then passed into the acid liquid. A large quantity of chlorine was disengaged from a solution of sulphate of potassa (10.) To ascertain whether the nitric acid in its turn was decomposed by hydrochloric acid, the following experiment was made:—

12. Into a solution of 100 grammes of pure sulphuric acid, and 2.1 grammes of hyponitric acid, a current of hydrochloric acid was passed for half an hour, and afterwards by the application of heat the hydrochloric acid and chlo-

rine were expelled; half of this was then again treated with a current of hydrochloric acid, but this time no chlorine was produced. A portion of the other half was mixed with one-sixth of its volume of water freed from air. This water was introduced into a flask filled with carbonic acid.* The water was acidulated with the acid, and as soon as the flask became filled it was hermetically closed. On allowing the acid to cool, two drops of hydrochloric acid were added, the vessel was then closed and shaken. After half an hour the vessel was opened, when a distinct odour of chlorine was perceived.

In this experiment, care must be taken, 1st, that the acid be added to the water, that, immediately on the addition, nitric acid may be produced; 2d, that about six parts of acid to one of water be contained in the flask, to prevent an excess of water from counterbalancing the action of the hydrochloric acid on the nitric acid, at the moment of its formation (7.)

13. The sulphuric acid previously employed in the concentration of nitric acid was heated until it arrived at a constant boiling point. The acid, on being treated as above, with water and hydrochloric acid, exhibited the same phenomena, but by an addition of hydrochloric acid alone chlorine was never formed.

14. To 100 grammes of the concentrated sulphuric acid of experiment 13, 10 grammes of red nitric acid were added. By this solution, the latter lost its intense red colour; however, on heating the acid mixture in a retort, the neck of which was drawn out, and bent into a rectangle, the red vapours disappeared. Between 338 and 356° F. an effervescence took place, which seems chiefly to be derived from a disengagement of oxygen. At 374° F. the disengagement of gas became so powerful that the liquid seemed to boil; but at higher temperatures the formation of oxygen con-

*The non-existence of sulphate of oxide of nitrogen not being ascertained, it was necessary to take the above precaution.

siderably diminished, and at 482° F. it ceased entirely to be disengaged. Together with the oxygen, red nitric acid was distilled over, amounting almost to one-third of the sulphuric acid added.

The moment the temperature of the acid was found to be 620° F., the neck of the retort was introduced into a vessel in which carbonic acid was continually disengaged, and the flame of the spirit lamp was gradually diminished. The acid, which, when boiling, was of an intense yellow, after cooling became completely colourless.

15. Cooled down to the common temperature, the acid formed no chlorine with hydrochloric acid.

Being treated with water, as in experiments 12 and 13, on an addition of hydrochloric acid, the acid gave chlorine.

Another portion of the acid being mixed with alcohol, the air being excluded, formed nitric ether.

Copper dissolved in it, with a violet colour, and a disengagement of binoxide of nitrogen.

After having adapted to the tubulure of the retort, a funnel provided with a stop-cock, through this were first introduced carbonic acid, and then 26 grammes of acid. Heat was afterwards applied, and when the water was boiling the cock was opened. The temperature of the water was considerably raised by the addition of the acid. At the same time, red vapours were disengaged, and received into water with carbonate of lime suspended in it; heat was then applied until the temperature of the acid arrived at the boiling point of sulphuric acid. The liquid separated from the carbonate of lime was evaporated to dryness, and the residue was exhausted with alcohol. The alcoholic liquid, on being evaporated, in its turn, gave a residue, which, on calculation, left 0.21 grammes of lime.

These facts being established, we mean to apply them to aqua regia and hyposulphuric acid, in order more fully to ascertain the nature of these liquids.

ON THE NATURE OF AQUA REGIA.

16. Aqua regia is very peculiar in its characters and functions. Its formation is especially influenced by the temperature, by the degree of concentration of the two acids from which it is formed, and by the presence of a body capable of combining with chlorine.

17. By mixing hydrochloric with nitric acid, both being concentrated, and the temperature very low, no reaction is caused. The cold liquids are mixed without colouration or disengagement of chlorine. If, however, the mixture is removed from the refrigerating medium, and put in a place in which the temperature is 32° F., it gradually becomes coloured, and chlorine is disengaged.

18. A mixture of two volumes of hydrochloric acid of 37.60 per cent., and one volume red nitric acid, forms chlorine only at a temperature above 9° F. Nitric acid, containing 74.5 per cent. of real acid, being treated with the same hydrochloric acid, is coloured, and forms chlorine, at a temperature above 21° F.

The presence of a greater amount of water may still further retard the reaction. Finally, if the acids be very much diluted, even by the application of heat, no reaction is caused; if, however, in the latter case, a metal be thrown into the liquid, a reaction follows, and water is formed. Soon afterwards, this liquid diminishes the affinities to such an extent, that the reaction would entirely cease, if a metal of the sixth class—for instance, gold—were made use of.

19. These phenomena prove that the formation of aqua regia is by no means the effect of the mutual reaction between the elements of hydrochloric and nitric acids (the latter being considered as composed of $N^2O^4 + O$,) but that it is to be attributed to the action of the hydrogen of the one upon the oxygen of the other. To produce the effect, it is indeed requisite that, either by the application of heat, or the use of a body having great affinity for chlorine, or these

two agents jointly, the affinity of the chlorine for the hydrogen of the hydrochloric acid be reduced, and that the affinity of the same metalloïd for the hydrogen of the water be counterbalanced, to augment the dishydrating power of nitric acid. *If a double affinity predominated in this reaction (7,) these phenomena would not be perceived, the chlorine would not be disengaged, or enter into a combination, the moment of its formation, to combine with the hyponitric acid.*

In making these remarks, we have not lost sight of the various circumstances in which a chemical action commences, the moment the affinities by which it was called forth are annihilated. We even have premised the hypothesis by which hyponitric acid is considered as a radical. We attempted to support the hypothesis, by allowing hydrochloric acid gas to act upon concentrated nitric acid, at a low temperature, protecting it at the same time against the influence of water. Instead, however, of obtaining the combination ($\text{N}^2\text{O}^4 + \text{Cl}^2$), we perceived, and demonstrated, that these acids were reduced to water, chlorine, and nitrous acid (11, 12, 14.) These are the products furnished by an active aqua regia.

The causes by which these are produced may be, 1st, the striving of the chlorine to pass into the gaseous state, or to combine with metals; 2d, the instability of the nitric acid and its dishydrating power; 3d, the tendency of nitric acid for becoming volatilised or forming combinations.*

*M. Baudrimont says that, by putting together hydrochloric acid of commerce and nitric acid of 86°C ., he obtained a gas of a peculiar nature. This gas, which he considers as the active principle of aqua regia, would be that which corresponds to nitric acid, and be represented by the formula $\text{N}^2\text{O}^3\text{C}^2$. I know not whether M. Baudrimont, in asserting this, was not influenced by the hypothesis of Mr. E. Davy, according to which the product obtained by the action of nitric acid on fused sea-salt, would be the active principle of aqua regia.

Certain it is, that if the chloronitric acid exists, it must be possessed of peculiar properties, among others—to yield nitrous acid to sulphuric

ON HYPONITRIC ACID CONSIDERED AS AN OXIDISING AGENT.

20. We have just seen that the action of hydrochloric acid upon nitric acid becomes embarrassed as soon as the latter is reduced to the stage of nitrous acid. This is manifestly owing to the circumstance that the oxygen is in a more intimate state of combination in the latter acid, than in nitric and hyponitric acids. Nitrous acid is, therefore, the most stable, and, consequently, of the three stages of oxidation of nitrogen, the least powerful oxidating agent.

This inference, drawn from the reaction between hydrochloric, nitric, and hyponitric acids placed in concentrated sulphuric acid, is far from coinciding with that which Millon concluded from his experiments. According to this chemist the process of oxidation by nitric acid is in general the following:—nitrous acid is formed first, and with this nitrite of copper, mercury, silver, &c., produced; these salts are again destroyed by the nitric acid, and this destruction giving rise to the formation of oxide of nitrogen, the latter body on coming into contact with the nitric acid reforms the nitrous acid, the metal is then attacked again by this acid, and the salt formed destroyed, and so on in succession.

acid (*vide* the details of my experiments;) *not to combine with the elements of water; but to furnish nitrates and chlorides with the metalloids; to attack gold, and to explode with silver reduced to powder; to act, but slowly, however, on potassium; with the powder of antimony or arsenic to produce intense phenomena of light and heat, without producing similar phenomena with fused phosphorus* (*Annalen der Chemie und Pharmacie*, xlviii. p. 202, and *Traité de Chimie Générale*, &c., par A. Baudrimont, i. p. 616.)

If the French chemist, instead of having employed the raw products of commerce, had operated with dry hydrochloric acid, and if he had taken care to dry the chloronitrous gas, and to ascertain the absence of hydrochloric acid, it might have been possible to form an opinion on the merits of his work, the data of which require more minute researches.

We know not, whether in the action of the metal on the nitric acid, the formation of a nitrite always precedes that of a nitrate; but it does not appear to me that the production of a nitrite by the action of an alkali on a saturated solution of oxide of nitrogen in nitric acid, permits us to accede to the hypothesis of M. Millon, because the formation of hyponitric acid precedes that of nitric acid, and because, if the nitric acid, as is generally the case, be present in excess, only hyponitric acid is formed. Nor do I conceive how nitrous acid, one of the most powerful oxidising agents, can combine with protoxide of mercury. The presence of nitrite of protoxide of mercury, the circumstances attending its formation, the property of the phosphorous acid to resist the oxidising power of the nitrous acid, the formation of nitrous acid by the action of hydrochloric gas on nitric acid and hyponitric acid; the production of hyponitric acid by the action of oxide of nitrogen on an excess of nitric acid, the circumstances attending the formation of nitrite of oxide of ethyl, and the influence of heat on alkaline nitrates are all facts wholly incompatible with the hypothesis of M. Millon; and the important observations made by the author himself, prove to evidence, that of all the stages of oxidation of nitrogen the hyponitric acid is the most powerful oxidising agent.

If the reverse were the case, if the hyponitric acid were a less powerful oxidising agent than the nitrous acid, an anomaly would occur in the oxidising powers of these stages, for the greater the amount of oxygen they contain, the more powerful oxidising agents they are. In a manner, that oxide of nitrogen, which, in the presence of iron, zinc, or phosphuretted hydrogen, is converted into protoxide of nitrogen, resists the deoxidising power of copper. Nitrous acid, which yields one-third of its oxygen to copper, in the presence of phosphorus and hydrochloric acids, undergoes no change, though either of them may convert the hyponitric acid into nitrous acid. With reference to the nitric

acid, it appears, beyond doubt, to be a stronger oxidising agent than hyponitric acid, if it could only exist by itself.

Chemist, from Annalen der Physik und Chemie.

ART. LIX.—NOTE ON SANTONIN OR SANTONIC ACID.

By H. GUALTIER DE CLAUERY.

BEING at Venice a short time ago, Professor Zantedeschi communicated to me the results of a curious experiment which he made on santonine, and which was opposed to those which different chemists have obtained, with several organic colouring matters, and in particular those of Professor Bizio on the purple of the ancients.

It is known that indigo and orcin, for example, are colourless, and take the brilliant tint which characterises them only by the absorption of oxygen; other analogous facts appear to lead to the general result that many colouring matters present the same character.

It is known that santonin, exposed to the action of the solar light, speedily acquires a yellow colour; but is oxygen in this case the principle which actuates this change? According to the experiments of Professor Zantedeschi, this does not appear to be the case. If santonin be exposed to isolation in the barometric vacuum, it acquires a yellow tint almost as bright, and nearly in the same time, although rather less rapidly, as another portion of the same substance, placed under the same luminous influence in the air or in oxygen. Professor Zantedeschi concludes from this that the colouration is due to a peculiar action of light.

Without adopting this conclusion, which could only be the result of numerous experiments, it may be well to call to mind a very old experiment of Dr. Vögel, sen., in which phosphorus, exposed to complete isolation in hydrogen gas or *in vacuô* was converted into a red body analogous to the oxide of this body.

Ibid, from Journ de Pharm.

ART. LX.—RESINEONE OF TAR A THERAPEUTICAL AGENT.

By DR. PÉRAIRE.

DR. Péraire, knowing long ago that tar is an efficacious therapeutical agent, but that owing to its being disliked by most patients, it acquired only little reputation in medicine, he contrived to separate from this body, so disagreeable in taste and odour, the active matter, which may easily be employed. The important researches of M. Frémy (*Ann. de Chimie et de Physiq.* vol. lix.) paved the way for M. Péraire. This distinguished physician, however, experimented with the tar itself, and not with the resin. The process which he adopted is as follows:—

It is known that on distilling tar, either with water or unmixed, an oil is obtained, which is called *oil of cade*. M. Péraire subjected this product to a fresh distillation, and the results were nearly the same which M. Frémy obtained from the resin.

Previous to commencing the operation, a fragment of potassa is put into the oil of cade, to saturate any acids present. On placing the mixture in a retort, and applying heat, it behaves in the following manner:—Like the resin, the tar boils at 155° F., and on distillation a colourless oil

passes over, which is the *résinéone*; by raising the heat to $297\frac{1}{2}^{\circ}$ F., *résinéone* is obtained in a more abundant quantity; and at 482° F., *résinéine* is obtained. If at each period of the operation the receivers were exchanged, the three products of tar may be separately collected.

Dr. Péraire subjected these three substances to chemical experiments. He found that *résinéone* has precisely the same properties as the tar, and that the healing art ought to have recourse only to the colourless oil, substituting it for the impure matter; *résinéone* and *résinéine* seemed to be much less active.

The recently prepared *résinéone* of tar is a liquid, colourless, essential oil; of a penetrating odour. Placed on the tongue, it provokes a sense of heat, and an acrid taste. Shortly after, this sensation disappears, and a balsamic odour is perceived, of an agreeable nature. The *résinéone* is endowed with all the properties of essential oils; it is inflammable, soluble in ether. By distilling five parts of *résinéone* with 100 of alcohol, an alcoholate is formed. By mixing these two substances in a cold state, the same product is rapidly obtained; the preference is to be given to the latter process. By this means it is easily determined quantitatively. The protracted influence of light imparts to *résinéone* a slight yellowish tint. By mixing 995 parts of sugar with 5 parts of *résinéone*, a saccharate is formed, containing $\frac{1}{4}$ per cent. of *résinéone*. This saccharate is given three or four times a day, in doses of a spoonful, with a cupful of an infusion. It is employed with advantage in catarrhs of the lungs, chronic bronchites, and bronchorrhœa.

The saccharate may likewise be administered in the form of a loöch, in the following manner:—

White loöch of the Pharmacop. (French) 125 parts.

Saccharate of *résinéone* - - - 30 do.

Five parts of *résinéone* mixed with 995 parts of oil of

sweet almonds formed an oleate; in this form the résinéone easily enters into the composition of loochs. 15 parts of it are given with 125 parts of a potion.

By mixing 990 parts of sugar with 5 parts of résinéone, and 5 parts of gum, a mixture is obtained, well qualified for pastilles.

The alcoholate of résinéone, containing $\frac{1}{4}$ per cent. of résinéone, is to be taken on sugar, at the doses of six drops four times a day. It is recommended in chronic catarrhs of the bladder.

Externally the résinéone seems to have rendered remarkable services in cutaneous diseases.

A pomatum may be formed of it in the following manner:—

Ceratum, without water	-	-	30 parts.
Résinéone	-	-	4 do.

Mix.

M. Péraire has applied this mixture with success in several cases, which are commonly called dartres (tetter.) (*Gazette Médicale de Paris*, 14th Dec., 1844.)

We think that with reference to cutaneous diseases, M. Péraire could have employed the résinéone with more advantage in the *squammous affections*, viz., in psoriasis, ichthyosis, prurigo, &c., than in cases of dartres (tetter,) or with a humid secretion. At least, tar was hitherto employed with more success in those affections, than in cases of dartres.

Ibid from Journ. de Pharm. et de Chim.

ART. LXI.—NATURAL HISTORY.—Extract of a work upon Singapore, addressed to M. De Lagrenér, Minister Plenipotentiary, residing in China, by DR. YVAN, Physician of the Legation, and Professor in the Secondary School of Medicine, Marseilles.

Manilla, Aug. 1st, 1844.

The Chinese are the only inhabitants of Singapore engaged in the fabrication of the substance known in commerce under the name of *Gambir* and *terra japonica*, as also the cultivation of the shrub producing it. Of this culture and manufacture I am about to give a brief description. The gambir, *nauclea-gambier*, of which I do not give a botanical notice, (it being found in all botanical works) is a bush of the family *rubiaceées*, attaining to 8 or 10 feet in height. Its flexible branches spread out fully and occupy a considerable space; they are slender, and laden with leaves that afford but slight shade, and are easily penetrated by the sun's rays. Sometimes the Chinese sow the seeds of this bush to obtain the plants necessary for them; at other times, and it is the method more generally adopted, they are satisfied to plant in the soil, slips taken from existing plantations. For this they prepare the ground beforehand by pulling up all the plants that might hinder the development of that which they would propagate; an interval of three or four feet is allowed between two stalks of *nauclea*. This done, they abandon the plantation to itself; the only attention it receives afterwards, is several months later, in ridding the plants of the parasites which have seized upon them. At the fourteenth or sixteenth month the bushes have attained their full development, and the first collection of leaves may be made with which to prepare the extract known under the name of gambir. This is done in the most simple manner: a furnace of the largest size, a cast iron or copper kettle,

rigged up under a shed, are the only two indispensable objects for this operation. The kettle is filled up with water and the leaves of the *nauclea* heated, and ebullition sustained, until the leaves are completely softened and decolourized by the coction. The leaves are then lifted up with a fork and placed upon a piece of wood, hollowed so as to form a spout, and so disposed that the water with which the leaves are impregnated, drips little by little, and runs again into the kettle.

If the decoction is not sufficiently charged with the active principle, new leaves are added; but if sufficiently charged, it is concentrated to the form of an extract.

The point of concentration attained, the extract is run into a kind of cake, having raised edges, and cut into pieces of about the same size. If intended to be sold to the people of the place, and especially the Malays, who mix it with lime and areca nut, adding to these ingredients the betel leaf, which they chew constantly, it is divided into pieces of three *centimetres* wide, by fourteen long and four to five in thickness.

As fast as these divisions are separated from the principal mass they are carried upon palm mats to be dried in the sun, and receive a rapid desiccation.

Gambir, before being completely dry, is of yellow colour, not very deep; it offers but slight resistance, and is easily crushed between the fingers without adhering by the effect of pressure. As soon as it begins to dry, it blackens upon the surface and assumes an inward deep brown colour.

The merchants of Singapore designate this substance under the name of *catheu*; *terra japonica* and *gambir* being more particularly given to it by the Malays: for the first, *cachou* and *gambir* are an absolutely identical substance, though the product of different countries and vegetables. It is true that the extract of the leaves of the *nauclea gambier* resembles the catechu extract of the *acacia C.*, as also the gum kino; but these three substances are far from being identical. * * * *

What seemed to me actually demonstrated, is the fact, that in no country is the substance known as gum kino, produced by the *nauclea gambier*; the name of gum of gambir, which the merchants sometimes give it, is alone the cause of the error into which the authors of works upon Materia Medica have fallen in this respect.

The Chinese and the Malays attribute to the extract of the *nauclea* great medicinal properties: they employ it with decided success in cases of chronic dysentery. Under these debilitating climates, the astringent properties it possesses are eminently suited to impart to the organs a tonic action, which restores their functions. It is not, however, by reason of its medicinal properties, that the culture of gambir since several years has taken so wide an extension at Singapore. From a time immemorial this extract has been employed in China for the tanning of leather; and the English, so prompt to seize upon the industrial processes of successful application in other parts of the world, have not been behindhand in appreciating the tanning properties of a substance, the power of which is not to be compared with any other astringent substance. With this view immense quantities are exported to England. * * *

This shrub is well adapted to skirts of woods, arid places and rising grounds; it requires neither manure nor any improvement, contenting itself with a light soil, and exacts little or no labour in its cultivation.

All the gambir plantations are at a distance from the town of Singapore, and in the neighbourhood of pepper plantations. The boiled leaves of the *nauclea* serve as an excellent manure for the branchy plant furnishing the black pepper, and the culture of the two can be well conducted together.

Whilst sojourning a length of time amidst the Malay population, I naturally sought to become acquainted with the preparation to which these people submit their *kreïs*, which pass for murderous weapons, imparting mor a

wounds. A Malay, in whom I had full confidence, and who enjoyed a certain reputation among his countrymen, showed me the process generally made use of, to render their arms poisonous. They first scour the blade of the instrument with quick-lime, then sprinkle upon one of its sides arsenious acid in impalpable powder, and upon this part pour lemon juice. After this first operation they allow it to remain for a length of time until they suppose all reaction has ceased. When they perceive that the lemon juice is almost wholly absorbed, they delicately wipe the surface upon which they have been operating, and coat it with the concentrated juice of a root which I believe to be the *menispermum cocculus*. They then operate in the same manner upon the other side of the kreis, and lastly cover the instrument with a small quantity of oil of cocoa. These arms do not preserve for a long time their poisonous properties; I have seen a small sized dog, stabbed with one of these newly prepared instruments, die in the space of an hour, exhibiting all the signs of death by a narcotic poison; whilst persons to whom I have been called to attend, wounded with instruments that had been poisoned several years previous, experienced no other inconvenience than usually attends slight wounds from a sharp instrument. In cases of sickness, the Malays of Singapore never have recourse to European physicians. There exists among them certain professors of the healing art who possess their confidence, and who in their eyes have traditional secrets upon the knowledge and treatment of diseases, in vain to be sought elsewhere. One of these men affirmed to me that he had in his possession medical works that had been transmitted by his forefathers the Malays; but these pretended works on medicine are mere collections of receipts, more or less whimsical and extravagant, which have been bequeathed to them by the Arabs, from whom they hold all that constitutes social individuality, viz.: religion, customs, and industrial arts. I convinced myself that

the Malay doctors do not practice bleeding in any case, whatever.

I have, however, found these Malays in possession of a plant which can be of use as an efficient remedy, and with which English therapeutics is already made acquainted; this is the *menispermum verrucosum*, employed by them as an anti-periodic.

There is found in the Singapore market a substance of exceeding high price and which deserves to draw attention: this is the camphor known under the names of Malay camphor and *capur-barus*. It is exhibited under the form of white crystalline bodies, composed of pieces none of which exceed the size of the thumb nail, and they present a rectangular form. Each piece seems formed like crystals of small similar particles, the one united to the other. It is certainly a natural product, being found in a concrete state in certain parts of the tree which produces it, and is not made to undergo the least preparation. The proofs in support of this opinion are furnished by the evidence of the natives of Borneo and Sumatra, where it is collected, and furthermore by certain characters of which I shall speak. The near transparency of this body, and its hardness compared to that of refined camphor, satisfy us that it is formed with extreme slowness; its lamellar form and micaceous appearance prove, on another side, that it is not consolidated in the open air, but that its crystallization is effected within a very confined space.

Some authors suppose that this camphor, which is produced by the *dryabalanos camphora*, or *shorea robusta*, runs from incisions made upon the branches and trunk of this tree. But this opinion is inadmissible when you take into consideration the extreme volatility of this substance, so that those who consider it to be under the bark of the tree or more likely to be found in its roots, are, in my view, most correct. Its excessive price, notwithstanding, explains nothing. It is well known that a large quantity of camphor imported into Europe comes from China, and it is precisely for this latter country that all the Malay camphor collected in Borneo and Sumatra is bought,

where the Chinese pay for it per pound the price they sell their own camphor per quintal.

For this reason I do not think the least quantity has ever been exported to France. Does the high price attached to it come from its purity as compared with crude camphor? If this could be supposed, the Chinese would better appreciate our refined camphors, which have a much finer appearance but which they refuse to purchase when offered to them. Have the Chinese doctors, as has been vulgarly said, discovered certain medicinal properties in the Malay camphor which does not exist in that produced by the *laurus camphora*? It is hardly probable. The *capur-barus* does not seem to differ sensibly from ordinary camphor. It is more compact, it is true, perhaps of greater specific gravity and less volatility; but all its characters connected with molecular arrangement are insufficient to attribute to it special properties. However, it has appeared worth while to the Minister Plenipotentiary in China to select some of our countrymen to prove, by direct analytic experiment, the difference that may exist between this camphor and the camphor employed in Europe, for which purpose we have provided ourselves with a number of specimens of this substance. From what I have seen, the Chinese and Malays of Singapore and Malacca employ the *capur-barus* for frictions upon the eyelids, by passing over these parts a piece with as large a surface as possible, which explains why this camphor sells proportionally dear as its fragments are large or small. These frictions procure a momentary coolness, extremely agreeable; and when the eye is fatigued with too much light, or prolonged exercise, it has the immediate effect of restoring its precision and clearness. The refined camphor of Europe employed in the same case, if my personal experience is to be relied on, has not this calming property.

A. D.

ART. LXII.—EXPLOSION PRODUCED BY THE COMBUSTION OF POTASSIUM.

Mr. DUVIVIER, Pharmacien, observes as follows :—

Reading in the Journals the accident which happened some time ago to Mr. Malagutti, Professor of Chemistry, attached to the Faculty of Sciences of Rennes, who, in trying the reaction of Potassium upon a new organic substance, had his left hand lacerated by the glass broken in the explosion of a tube with which he was operating, brings to mind an accident which happened to me some years ago.

I had thrown upon water a small ball of potassium ; it inflamed immediately and burnt, ploughing up the surface of the liquid. When, by the combustion, the little ball was somewhat reduced in volume, all at once an explosion took place, throwing in different directions particles of the flaming potassium, one of which struck the forehead of a person standing near, occasioning a slight eschar. I was the more surprised at this phenomenon, as I had on various occasions previous to the accident placed potassium in contact with water, which burnt to its complete conversion into potash without exploding. I do not pretend to explain a phenomenon of this nature, or give any positive theory respecting it, but I have sought to account for this peculiarity, and with this object have reflected upon all the circumstances which might concur in the production of this phenomenon. The potassium I employed had been wiped with bibulous paper to get rid of the naphtha in which it had been preserved; its surface was slightly coated with oxide. I do not suppose that this particular state of the potassium could in any wise favour the production of this phenomenon. Allowing that the potassium had retained a small quantity of naphtha, that the hydrogen of this carburet in combining with the oxygen of the air at the same time that its carbon in the state of carbonic acid united to the oxide of potassium, and that these reactions

had determined the explosion, which is hardly probable, they would have been manifested at the commencement of the combustion; but not so, when the explosion happened, the principal part of the potassium had been converted into potash, and only towards the close of the experiment did the explosion occur.—On the other side, it is known with what energy potassium decomposes water, of which the hydrogen at an elevated temperature resulting from chemical combination inflames by contact with the atmospheric oxygen. Can we not suppose, that the capricious influence of the electric forces under peculiar circumstances may bring about the moment when the double combustion of the potassium and the nascent hydrogen can no longer operate in a normal manner and hence cause an explosion?—However, it will be seen from this, that in experimenting with potassium, whether in acting upon substances having for their constituents the elements of water, or burning it upon this liquid, it is always prudent to avoid the dangers of an explosion.—*Journ. de Chim. Med.*

ART. LXIII.—ON A NEW KIND OF ADULTERATION OF THE
MURIATIC ACID OF COMMERCE.

By DR. A. VOGEL, JUN.

THE contaminations of muriatic acid hitherto known, mostly originating from the sulphuric acid employed in the decomposition of common salt, consist for the greatest part of sulphurous, sulphuric, and nitric acids, chlorine, the chlorides of arsenic, tin, iron, and probably of selenium also, if the acid of Nordhausen be made use of in the decomposition. I lately received an acid of commerce, which, besides traces of chlorine and iron, contained none of the above impurities;

being, therefore, considered pure enough, it was employed in some qualitative analyses. On directing, however, the practical chemical manipulations, I had frequent occasion to remark that, from completely pure metallic salts, the acidulated solutions of salts which are not precipitated by sulphuretted hydrogen, yet on being acidulated with the above muriatic acid, a black precipitate was invariably thrown down. This observation naturally raised the suspicion, that the hydrochloric acid contained a body causing the said precipitate; I, therefore, examined the acid more minutely. Several experiments showed, that the hydrochloric acid contained chloride of lead, in no inconsiderable quantities. The precipitate thrown down by sulphuretted hydrogen which was brown-red at first, and on employing an excess of the latter body turned black, was sulphuret of lead. On diluting the acid with water, small shining leaflets of chloride of lead, were gradually deposited, owing to the greater solubility of this salt in the concentrated acid than in water. The crystals easily fuse before the blow-pipe, and on being calcined with soda, the metallic lead is reduced; and by being moistened with hydrosulphate of ammonia they become black. With sulphuric acid a white precipitate is thrown down in the acid. Potassa and ammonia throw down a precipitate, which on account of the traces of iron admixed is somewhat yellowish.

To determine the amount of chloride of lead contained in the acid, one ounce of the same was slowly evaporated to dryness. The dry residue weighed 4.75 grammes, which corresponds nearly to 1 per cent.

The presence of chloride of lead in hydrochloric acid, may easily be accounted for, since, in some manufactures, as is known, the decomposition of common salt, and the distillation of the acid is effected in leaden vessels.

Very distinct crystals of chloride of lead may be obtained by evaporating the acid to one-third of its volume, when, on cooling, this salt is deposited in large quantities. Hydro-

chloric acid, which contains so much lead, is, of course not fit to be employed in chemical experiments. By distillation, however, the acid may be completely freed from that impurity. No trace of lead is met with in the first receiver.

Chemist, from Buch. Rep.

ART. LXIV.—ON A MOLECULAR MODIFICATION OF OIL OF TURPENTINE, RENDERING IT CAPABLE OF MORE READILY DISSOLVING CAOUTCHOUC.

By M. BOUCHARDAT.

TEN years ago, I was consulted by a manufacturer of water-proof cloth, to discover the best solvent for caoutchouc. At that time, the practice in England was to employ coal-tar naptha, or an oil obtained by the distillation of caoutchouc over a naked fire.

I commenced by carefully examining this pyrogenous oil. I separated from it several well-defined hydro-carbons, remarkable for their low boiling point, but I soon found that the price of this oil would long prevent its use in manufactures. The essential oil from coal has so disgusting and permanent a smell, that I resolved to seek for another solvent.

From the first, I thought that turpentine, which, as is well known, dissolves caoutchouc, might be so modified by heat as to supply the solvent we required, and experience proved the truth of this supposition. By distilling oil of turpentine once or twice over a naked fire, we obtain a very satisfactory solvent. In making this distillation on brick, the essence being submitted to a higher temperature, it becomes

very little inferior to caoutchouc. This is now the solvent for caoutchouc, employed both in France and England, for the manufacture of impermeable textures. What change has this process effected in the turpentine? Does it form new volatile products, or is it simply a modification of the molecular constitution of the oil? We can now answer these questions.

The physical properties of the oil distilled on brick are as follow:—The colour is slightly yellow, its odour that of a mixture of thyme, naphtha, and turpentine. It is more limpid than the essence from which it is formed, the density of the former being, 0.8736, and after distillation, 0.8420. It begins to boil at 85° C., but the temperature immediately rises to 154° , and remains at this point nearly stationary. I have tried to isolate the more volatile part of the distillate, but without success. The unchanged oil boils at 151° to 158° , whilst the distilled boils at 150° . I analysed the modified oil, and found its composition precisely the same as the original. The nature of the modification in question being still obscure, during the last winter I employed the apparatus for polarization belonging to the Hôtel Dieu, to pursue the inquiry, and I found that by its means I was able to perceive the molecular change which the turpentine had undergone in becoming able to dissolve the caoutchouc.

Commercial oil of turpentine, acting imperfectly upon caoutchouc, has a molecular rotation of $-28^{\circ}, 83$. After distillation over a naked fire, this became $-33^{\circ}, 23$; its power of dissolving caoutchouc increasing with its power of molecular rotation. If the same essence, however, is modified by a temperature still more elevated, as by distilling it on fragments of brick, its solvent power increases still further, but the change produced is accompanied by a considerable diminution in its rotatory power, which is then only $-8, 68$.

By varying the conditions under which the oil is distilled, various modifications are obtained, which prove that a substance with a definite composition may exist in several isomeric states.—*Ibid*, from *Comptes Rendus* and *Lancet*.

ART. LXV.—ON THE TRUE COMPOSITION OF LABARAQUE'S
SOLUTION OF CHLORIDE OF SODA.

By B. KAVANAGH, Esq.

THE solution of chloride of soda, or the liquor sodæ chlorinatæ, of the London Pharmacopœia, prepared by passing a stream of chlorine gas through a solution of carbonate of soda, is a preparation whose theoretical composition has hitherto been involved in doubt.

MM. Millon and Balard have conceived, and put forward different hypotheses regarding it. The latter chemist considered it to be composed of bicarbonate of soda, hypochlorite of soda, and chloride of sodium. Thus:—suppose four atoms of carbonate of soda to be acted on by two atoms of chlorine. Two atoms of the carbonate of soda lose their carbonic acid, which uniting with the other two atoms of carbonate of soda produce two atoms of bicarbonate of soda. Then one of the remaining two atoms of soda loses its oxygen, and there remains sodium, with which one atom of the chlorine unites, to form chloride of sodium, whilst the disengaged oxygen unites with the other atom of chlorine to form hypochlorous acid, and this uniting with the remaining atom of soda forms hypochlorite of soda. This view of the subject, however elegant in conception, and strengthened by his discovery of the existence of hypochlorous acid (composed of one atom of chlorine and one

of oxygen,) and indeed the theory generally adopted at the present day, will be seen to be totally untenable.

M. Millon considers it to be composed of bicarbonate of soda, and oxychloride of sodium. Thus: one atom of chlorine, and two atoms of carbonate of soda, react on each other. One atom of carbonate of soda loses its carbonic acid, which uniting with the other atom of carbonate of soda forms one atom of bicarbonate of soda, whilst the atom of chlorine acting on the remaining atom of soda, form chloride of soda or oxychloride of sodium, according to Dulong's theory of the salts. Namely, that the oxygen or electro-negative element of the base, joins with the electro-negative element added, which uniting with the metal of the base, form a compound analogous to an haloïd salt, except that the electro-negative element is compound. This oxychloride of sodium he considers analogous to the peroxide of sodium in which one atom of oxygen is replaced by an atom of chlorine.

By means of some researches which I have recently made, and which I shall now submit, I have proved, I trust, that this latter theory is a correct one.

That the chlorinated solution contains a carbonate is evident by its giving a white turbidity on the addition of lime water. That this is the bicarbonate may be known by its giving no precipitate with solution of sulphate of magnesia. Now, if to the chlorinated solution we add a solution of alum (the double sulphate of alumina and potash) the alumina is instantly precipitated, *without effervescence*, proving that the chlorinated solution contained a salt of soda other than the bicarbonate, for it must be by it the alumina is replaced, accompanied, on the application of heat, by the evolution of a chlorinous gas. Whether this soda salt is a hypochlorite of soda, or a chloride of soda (oxy-chloride of sodium) involves the point at which MM. Millon and Balard are at issue. The question of course can be solved by ascertaining the nature of the chlorinous gas evolved

whether hypochlorous acid or pure chlorine. With this view I placed at the end of the tube from which the gas was allowed to issue a coil of iron wire in order to determine whether the gas was hypochlorous acid, as in such case an insoluble oxide of iron would be formed, but instead of this the soluble chloride was produced, known to be such by its giving with solution of nitrate of silver the usual curdy white precipitate, soluble in strong solution of ammonia but insoluble in nitric acid. I then placed a coil of silver wire in the end of the tube in a similar manner. After the action went on for some time, a white curdy mass was formed, soluble in strong solution of ammonia, but insoluble in nitric acid—chloride of silver.

The united results of both these experiments prove the gas eliminated to be pure chlorine, so that it settles the question in favor of Millon's theory,—that it is a compound of one atom of bicarbonate of soda in combination with one atom of oxy-chloride of sodium in solution.

Ibid, from Dublin Hospital Gazette.

ART. LXVI.—ON THE CONVERSION OF THE ESSENTIAL OIL OF
MUSTARD INTO THE ESSENTIAL OIL OF GARLIC.

By CHARLES GERHARDT.

THE artificial production of substances which are generated in the process of vegetation or in the animal economy becomes more and more frequent as organic chemistry advances. I shall now draw attention to one which seems to me to merit attention.

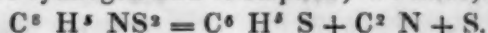
The essential oil to which garlic owes its characteristic odour has been recently analysed by M. Wertheim, and

according to this chemist contains $C^8 H^8 S$. It is therefore a sulphuretted body like the essential oil of black mustard, but free from nitrogen.

From the analyses of M. Lœwig, and from the researches recently made by Dr. Will, we know that the essential oil of black mustard does not contain oxygen, and that its true formula is $C^8 H^8 NS^2$. The result of M. Simon's observations also appears to be, that the essential oil of the Scurvy grass (*Cochlearia*) is identical with that of mustard; moreover, M. Hubatka has proved that the horseradish yields the same essential oil; and M. Wertheim has also met with it in the oil obtained by distilling the root of another cruciform plant, *Alliaria officinalis*, with water.

Considering these facts, and comparing the composition of the essential oil of garlic with that of mustard, I have been induced to try to convert one into the other by the means which science affords.

The oil of garlic only differs from that of mustard by the elements of cyanogen and of sulphur; we have, in fact,



In acting with potassium on the oil of mustard, I had to take away the cyanogen as well as a part of the sulphur, and to set free the oil of garlic.

My suspicions were entirely realized; when some pieces of potassium, previously dried over some chloride of calcium and rectified afresh, are thrown into the oil of mustard, it is attacked immediately. It may be slightly heated in a retort to favour the reaction; care must be taken, however, not to raise the temperature too much, for the substance might take fire, as has frequently happened to me.

If the operation is performed with care, the substance does not become much coloured, some gas is disengaged, a white salt is deposited in the oil, and oil of garlic distils over. It is an interesting experiment, the difference of smell between the two oils being so striking: the smell of the garlic is immediately so evident, that this alone might

suffice to prove that the conversion takes place as I have just described it.

But I desired to have chemical proofs. I therefore collected the oil which had been produced in the reaction; it was colourless, possessing in a high degree the characteristic odour of garlic, and presented the reactions described by M. Wertheim; shaken with a solution of nitrate of silver it afforded a black precipitate of sulphuret; with the bichloride of mercury (when the aqueous solution was slightly heated to dissolve more oil) it yielded a white, and, with the bichloride of platinum, a yellow precipitate.

Burnt with oxide of copper, it yielded the same relative quantities of carbon and hydrogen as were obtained by M. Wertheim in the analysis of the oil extracted directly from garlic, and rectified without potassium, viz.—

	Rectified oil of garlic.		Oil of
	My produce.	Wertheim.	Mustard.
Carbon	58.8	59.1	48.5
Hydrogen	8.4	8.2	5.1

I have not been able to make more analyses, from want of material.

The salt which separates in this reaction is *sulphocyanide of potassium*; in fact it dissolves easily in water, and gives with the persalts of iron the characteristic dark red colour; it also yields a white precipitate (protosulpho-cyanide of copper,) with a mixture of deuto-sulphate of copper and of protosulphate of iron, &c. I was unable to discover sulphuret or cyanide.

However, in rectifying the artificial oil of garlic a second time over potassium, I found much sulphuret in the residue. This reaction appears secondary. Besides, to understand the reaction well, it will be necessary again to examine the gas which is evolved, which want of material prevented me from doing.

The above results seem to be sufficiently conclusive to

prove that the oil of mustard is really converted into the oil of garlic by the action of metallic potassium. I intend, however, to return soon to this metamorphosis.

Chem. Gaz. from Comptes Rendus.

ART. LXVII.—PATENT GRANTED TO ALFRED VINCENT NEWTON, LONDON, FOR IMPROVEMENTS IN THE MANUFACTURE OF CYANOGEN AND ITS COMPOUNDS, PARTICULARLY THE PRUSSIATES OF POTASH AND SODA.

THIS invention consists in the application of nitrogen gas, which is obtained by the decomposition of atmospheric air or from the waste gasses of sulphuric acid chambers, to the manufacture of cyanogen and the cyanides. It is stated that, by the means adopted by the inventor, the difficulties of carrying into practical and economical use the grand principle of employing nitrogen obtained from the surrounding atmosphere have been surmounted.

The different materials which are employed in the process, according to the peculiar circumstances of the case, are as follows:—1. Whatever may be the source whence the nitrogen is obtained, it may always be employed, provided it is not accompanied by oxidating substances. It is not necessary that the nitrogen should be perfectly pure; it may be mixed with carbonic oxide, hydrogen, carburetted hydrogen, and other gasses; but the presence of oxygen must be carefully avoided, as well as all matters capable of affording it, as they would tend to destroy the cyanogen as fast as it is formed. This essential point is effected and obtained in an economical manner by using atmospheric air, taking the precaution to convert the oxygen contained therein into carbonic oxide, before it is permitted to come into contact with the cyanides already formed. The means by which this is accomplished will be hereafter explained. Another source of nitrogen is the waste gases of sulphuric acid chambers, after being washed in a solution of sulphate of iron and of

milk of lime, so as to deprive them of sulphurous and nitrous vapour. The nitrogen so obtained is employed in the same manner as if obtained directly from atmospheric air. 2. The nature of the carbonaceous material which is employed in the process is not of much consequence; satisfactory results have been obtained with wood-charcoal, coke, pit-coal, peat, spent-bark, wood, and other similar substances; but as regards economy, produce and convenience, wood-charcoal in pieces of the size of a hazel-nut is preferable to any other. 3. With respect to the potash and soda, the carbonates are preferred; but any other salt capable of being resolved ultimately into carbonate, oxide or metal, may be employed. Although the choice of the materials is not of much consequence, it is not so with regard to the mode in which they are employed; thus the more or less intimate mixture of the charcoal with the alkali, and the proportions of the two, have a great influence. If the alkaline salt is easily fusible it may be previously fritted with the charcoal, or the two substances may be carefully mixed. It is, however, in general preferable to soak or steep the charcoal in a concentrated alkaline solution, and to dry the mixture before using it; but whatever be the way of mixing the matters, it is of the greatest importance that they should be perfectly dry before they are placed in the retorts. The proportions of alkali and charcoal may be varied to a certain extent, but there are limits which should not be passed; an excess of alkali renders the chemical decompositions incomplete, and a too small proportion is not economical; but according to the difference in the density of the charcoal, it may vary from 25 to 100 parts of alkaline salt to 100 parts of charcoal. With hard wood charcoal, the proportions which have been found to answer best are from 30 to 50 parts carbonate of potash to 100 parts of charcoal, according to the intensity of heat in the retort. As regards the quantity of nitrogen gas, it must be used in excess to hasten the operations; still a too rapid current of gas must be avoided, because it would carry off with it a part of the cyanides already formed, and

also a greater or less proportion of unreduced alkali, and deposit them beyond the sphere of action. The combination of the nitrogen is effected most rapidly and completely when the gas is forced through a long column of alkalized charcoal, at a high degree of heat, and under a certain pressure, and when it experiences obstacles and considerable friction in penetrating through the pores of the charcoal and interstices between the pieces; all these conditions are combined in the most effective manner in the apparatus hereafter described.

After having considered these general questions, it remains to determine the most advantageous mode of constructing and working the apparatus. The points most worthy of attention are the following:—1st, heating the mixture of charcoal and alkali to the highest possible degree and in the most uniform manner, and taking the proper precautions to recover the vapours of potassium, sodium, and other alkaline and saline combinations that may be carried off with the waste gases; 2d, to force through the pores and interstices of the alkalized charcoal a steady current of air or nitrogen gas; 3d, to protect the mass of cyanized carbon from all contact with oxygen during the whole period of heating and cooling; 4th, a continuous operation, which is generally so advantageous in manufacturing processes, becomes here a necessity, or at least a most important consideration; because, setting aside the waste of fuel, labour and time, the dilatations and contractions caused by interruptions of the work, occasion a speedy destruction of the apparatus; on this account a perfect steadiness of firing and uninterrupted operations are peculiarly desirable.

The apparatus for carrying out these requisites may be varied in dimensions and form, and may be modified to suit different carbonaceous matters; but without confining the invention to the arrangements of parts herein set forth, two applications are described. The first and simplest form consists of one retort, which is of fire-clay or other suitable ma-

terial capable of supporting a white heat; it is slightly conical, tapering downward, and open at top and bottom; the best form in the transverse section is elliptic. This is placed vertically in a furnace, heated intensely, and as regularly as possible; its lower end rests upon the flange of a second retort, or refrigerator of cast iron, and of a similar shape, having at the bottom an extractor, mounted on suitable bearings, which is worked periodically by an attendant, to convey the cyanized charcoal into an extinguisher or dip-pipe, the mouth of the latter being plunged into a saline solution, which acts as a hydraulic valve. From the side of the dip-pipe, at a short distance below the extractor, is the waste gas-pipe, which conducts the gases and vapours into the hydraulic main; the end of this pipe is turned downward, and plunged into water or a solution of a salt of iron. By another pipe the incondensable gases are drawn off from the main by a pump, or other convenient aspirating machine.

In the other form of the apparatus there are ten retorts working with one air-pump and one hydraulic main,⁶ besides contrivances for drying alkalized charcoal, and a method of working the feeding and extracting apparatus by machinery. The pans or under-backs, which receive the cyanized charcoal as it drops from the extractor, are kept constantly charged with a protosalt of iron, or with hydrated protoxide of iron diffused in the liquor, for the purpose of converting the simple cyanides into ferrocyanides the moment they fall into the liquor. If thought desirable, a fire may be lighted beneath these pans to warm the liquor. The management of the furnace-fire requires much attention, to prevent variations of temperature, and coke is preferred to bituminous coal.

The working of the apparatus will be easily understood. The retort is kept constantly full of alkalized charcoal, and the air-pump set to draw a steady current of air through the materials in the retort. The gas drawn through maybe either burned air, common atmospheric air, or hot air, as supplied to ordinary blast furnaces.

The time required for reducing the alkali, and converting it into cyanide, is in direct ratio to the intensity of the heat; with a good white heat, two or three hours are sufficient to convert almost the whole of the alkali into cyanide.— Whether the retorts are fed by machinery or otherwise, care must be taken to keep them constantly full, according to the working of the extractor, which, as before mentioned, delivers the cyanized charcoal into the dip-pipe, where it drops into the saline solution below; but previous to this it may be cooled in the iron retort, by surrounding a part of that vessel with a cold water-chamber.

The liquor in the under-back should always contain a *slight* excess of iron or ferrosalts, or the alkaline cyanides will be decomposed into formiates of potash and soda and carbonate of ammonia. It is easy to ascertain when sufficient iron is present: by taking out a small quantity of the clear liquor, and dropping into it a little weak solution of protosulphate, or any other protosalt of iron, a white precipitate will fall without any tinge of red; but when, on the contrary, the liquor gives a brown red precipitate, or a mixture of red and white, it wants iron. When it is certain that the liquor contains a slight excess of iron, the charcoal is taken out and thrown into vats or cisterns, and washed, either with cold or warm water, until the salt is completely extracted; the weak liquors are passed successively through new charcoal, by which they are easily brought to 20° Beaumé's hydrometer. At this strength the liquors may be thrown into evaporating pans, and be boiled until the sulphate of potash falls down; this is separated as usual, and drained. The remainder of the liquor is then drawn off into other vessels to crystallize; or, instead of drawing it off, the evaporation may be carried still further, until the prussiate also falls down and separates in a similar manner. The potash mother-liquors serve for fresh operations. The first rough crystals are washed and crystallized a second time, as usual.— Sealed Dec. 13, 1843.—*Chem. Gaz.*

MISCELLANY.

On a new Method of detecting the Adulteration of Essential Oils. By M. MERO.—The sophistication of the different essential oils with oil of turpentine occurs daily in commerce, and no process capable of discovering the fraud with certainty is known; the odour and the various chemical tests have hitherto been insufficient. The essential oils of marjoram, lavender, spikenard, sage, thyme, rosemary, wormwood, and peppermint are the most subject to this adulteration.

In 1838, M. Mero discovered a method of detecting the presence of oil of turpentine founded on the circumstance that this oil dissolves the fixed oils with great facility, while the essential oils above mentioned do not. He considered therefore that it might serve to indicate the presence of oil of turpentine mixed with pure essential oils, whose powerful smell conceals that of the turpentine.

After a great number of experiments, he found that the oil of poppies deserved the preference, because it always possesses the same consistence. It gave the most accurate results in the detection of the presence of oil of turpentine, in small proportions, in the above-mentioned essential oils.

About 3 grms. of oil of poppies are poured into a graduated tube, and an equal quantity of the essential oil to be tested added; the mixture is then shaken, and should become of a milky white if the essential oil is pure, whilst it remains transparent if it contain any oil of turpentine.

The value of this process may readily be ascertained, by first testing a pure essential oil, and then some essential oil of turpentine; if the essential oil be then mixed with the oil of turpentine, even in proportions so small that no advantage could accrue to traders in mixing it, it is found to behave like the essential oil of turpentine itself, that is to say, the mixture is not rendered turbid.

To make this experiment successfully, the mixture of the two essential oils should be very intimate. The method employed in commerce for this purpose is this:—The pure essential oil, and the quantity of oil of turpentine which is to be added to it, are placed in a hot water-bath

basin, and this is heated until the mixture, which is at first turbid, becomes transparent.

The mixture which is obtained by adding oil of turpentine in the process of distilling the plants is detected in the same manner.

It is to be regretted that the process of M. Mero cannot be applied in a general manner. It will not detect the essential oil of turpentine in the essential oils of thyme and of rosemary. However, it furnishes the means of recognising the adulteration of several of the essential oils most in use.

The *Société d'Encouragement* has voted a medal to M. Mero. In some experiments before the Committee, he proved that he could determine at once the mixtures which contained 5 per cent. of oil of turpentine, and was moreover able to tell very nearly the proportions of the mixtures.—*Chem. Gaz., from Journ. de Pharm.*

Occurrence of Starch in Fruits.—Dübereiner found starch abundantly in green and half-ripe apples and pears. Mayer also found a considerable quantity of starch in the juice of apples. According to Schubert, however, starch does not occur until a later period of their development. He found in September that the surfaces of winter peas, exposed by transverse section, yielded as deep a violet colour with iodine as is observed in potatoes similarly treated, whilst no reaction occurred in the immature fruit. The period during which fruits contain starch does not appear to be of long duration.—*Ib. from Journ. für Prakt. Chem.*

On the Preparation of Strychnic Acid. By M. ROUSSEAU.—Strychnic acid is best prepared by forming 3 parts of strychnine with 1 part chlorate of potash and some water into a thick paste, and warming this with the addition of a few drops of sulphuric acid, after which from 8 to 10 times the weight of distilled water is added, and the whole boiled for a few minutes. On cooling, frequently some sulphate of strychnine or pure strychnine is deposited; they are separated by filtration and the filtered solution evaporated to crystallization. The acid may be then purified by washing with alcohol. It is of a pure white colour, readily soluble in water, but with difficulty in alcohol, has a strong acid reaction, and decomposes carbonates; it dissolves the oxides of copper, zinc and iron, and yields crystalline salts; it crystallizes in fine needles of a pure acid taste, is not volatile, but is decomposed by heat. The potash salt is white, soluble in water, insoluble in alcohol, crystallizes in four-sided prisms, and has a cooling taste. The persalt of iron is brick-red, of very acid taste, and extremely deliquescent. The persalt of copper crystallizes in green rhombic prisms, has a styptic taste, and is soluble in water but insoluble in alcohol.—*Ib. from Journ. de Chim. Méd.*

Curious Case of Poisoning with Arsenic.—In the examination of the corpses of two men, supposed to have been successively poisoned by the wife, Wöhler distinctly detected arsenic, even after an interval of seven years and six months. He incinerated all the soft parts of both corpses with nitre. In the man who died last, it was found that during the last moments of his life he had taken phosphuretted oil, and had therein consumed altogether about 16 grms. of phosphorus. On examination of the stock of phosphorus in the apothecary's shop whence it had been obtained, it was found to contain about a half per cent. of arsenic. The phosphorus used in the preparation of phosphuretted oil ought therefore in future to be tested for arsenic.—*Ib. from Ann. der Chem. und Pharm.*

On the preparation of Chlorine Water.—MM. Riegel and Waltz, in their experiments on the quantity of gas contained in chlorine water at different temperatures, have arrived at results exactly similar to those of Pelouze, except that they found the maximum somewhat greater than he did (3 vols. at 50°). They did not find Buchner's method preferable to that of the fifth edition of the Prussian Pharmacopœia. They also consider the preparation in the dark, and the preservation in bottles with glass stoppers, as unnecessary. The water appears to be best preserved in small bottles with good corks, and covered with bladder. That which contains about $2\frac{1}{2}$ volumes of chlorine, and preserved at 54° Fahr., appears to keep best. They recommend therefore that the chlorine evolved from 12 parts of well-dried chloride of sodium, 9 parts of peroxide of manganese, 10 parts of concentrated sulphuric acid and 10 water, be conducted into distilled water which is retained at the temperature of 54° Fahr. until it is saturated. The chlorine contained in it is best tested, according to the authors, with a solution of pure indigo in sulphuric acid, which is so diluted as to contain $\frac{1}{84}$ th of indigo. 2 parts of chlorine water of the above strength are exactly sufficient to decolorize 1 part of this solution of indigo. To detect muriatic acid, the authors recommend metallic mercury, and for chlorous acid the protochloride of mercury.—*Ib. from Jahrb. für Prakt. Pharm.*

Testing of Essential Oils by means of Sulphuric Acid. By M. VOGET.—The author considers concentrated sulphuric acid as the best reagent for detecting adulterations of essential oils with oil of turpentine. The peculiar colour which the former assumes with sulphuric acid is much altered by the intense reddish-brown colour which the oil of turpentine yields; and moreover the heat evolved with the oil of turpentine is greater than that with other oils. In testing, the oils are best dropped upon a glass plate, beneath which is placed a piece of white paper; 5

drops of the oil are then added to 1 drop of fuming sulphuric acid, and the two are mixed with the finger.—*Ib. from Archiv. der Pharm.*

Adulteration of Iodide of Potassium.—M. Destouches found in some iodide of potassium derived from Paris 22 per cent. carbonate of potash. The preparation was milk-white, turned red litmus-paper strongly blue, and effervesced with weak acids.—*Ib. from Journ. de Pharm.*

Mode of ascertaining the Purity of Myrrh. By M. RIGHINI.—The myrrh is finely pulverized and triturated for a quarter of an hour with an equal weight of sal-ammoniac powder, then 15 times the weight of water gradually added. If the whole dissolve quickly and entirely, the myrrh is pure.—*Ib. from Journ. de Chim. Med.*

Of the Manufacture of enamelled cast Iron Vessels.—Iron pots, and especially those of enamelled cast iron, are very extensively used in domestic economy. To enamel these vessels, they are cleaned as perfectly as possible with weak sulphuric acid, then washed with cold water, and dipped into a thin paste made with quartz first melted with borax, felspar, and clay free from iron, then reduced to an impalpable powder, and sufficient water added to form a rather thin paste. These vessels are then powdered in the inside with a linen bag, containing a very finely-pulverized mixture of felspar, carbonate of soda, borax and a little oxide of tin. Nothing then remains but to dry the pieces, and heat them in an enamelling furnace. The coating obtained is very white, resists the action of fire without cracking, and completely resists acid or alkaline solutions.—*Chem. Gaz.*

On Benzoline, a new organic Salt-base obtained from Oil of Bitter Almonds. By GEORGE FOWNES, Esq., F. R. S.—Pure oil of bitter almonds is converted, by the action of a strong solution of ammonia, into a solid white substance having a crystalline form, and which was termed by M. Laurent *hydrobenzamide*. The author found that this substance, by the further action of alkalis, became harder and less fusible than before, and not differing in chemical composition from the original substance, but exhibiting the properties of an organic salt-base. To this substance the author gives the name of *benzoline*. He finds that the salts which it forms by combination with acids are, in general, remarkable for their sparing solubility; and that many of them, as the hydrochlorate, the nitrate and the sulphate, are crystallizable. Of the properties of these salts the author gives a detailed account.—*Ibid.*

Ashes of Human Blood and Saliva.—100 parts of the human blood contain—

Tribasic phosphate of soda	-	-	-	-	22.1
Chloride of sodium	-	-	-	-	54.769
“ potassium	-	-	-	-	4.416
Sulphate of soda	-	-	-	-	2.461
Phosphate of lime	-	-	-	-	3.636
magnesia	-	-	-	-	0.769
Oxide of iron with phosphate of iron	-	-	-	-	10.77

100 parts of the ashes of the saliva contain—

Tribasic phosphate of soda	-	-	-	-	28.122
Chlorides of sodium and potassium	-	-	-	-	61.93
Sulphate of soda	-	-	-	-	2.315
Phosphates of lime, magnesia, and iron	-	-	-	-	5.509

Chemist, from Enderlin, Annalen, and Lancet.

Extract from a note on Lactucarium. By M. AUBERGIER.—M. Aubergier having ascertained that alcohol at 21° easily separates the active principles of lactucarium from the wax, resin, and other inert matters which accompany it, proposes to prepare an extract and syrup of lactucarium in the following manner:

Lactucarium is exhausted by being twice heated with alcohol at 21°; the liquors are distilled, and the evaporation is carried on in a sand-bath, with continued stirring. The extract thus obtained is brown, bitter, and deliquescent. M. Aubergier recommends its use for the preparation of pills and syrup of lactucarium.

R. Alcoholic extract of lactucarium,	-	-	-	1 part
Simple syrup	-	-	-	50 “

Dissolve the alcoholic extract in a sufficient quantity of boiling syrup. Strain the solution while warm, and immediately add to the boiling syrup. The syrup is rendered turbid by cooling, but it does not deposit.

—*Ib. from Journ. de Chim. Med.*